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FINAL FOCUSED FIELD INVESTIGATION REPORT BUILDINGS 36, NS84, 202, 643, 644, 645, 656 AND 657 CNC CHARLESTON SC

7/5/1996

ENSAFE

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY
NAVAL BASE CHARLESTON
CHARLESTON, SOUTH CAROLINA
CTO-029

FINAL
FOCUSED FIELD INVESTIGATION REPORT

Prepared for:

DEPARTMENT OF THE NAVY
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Prepared by:

ENSAFE/ALLEN & HOSHALL
5724 SUMMER TREES DRIVE
MEMPHIS, TENNESSEE 38134
(901) 372-7962

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LIST OF ACRONYMS AND ABBREVIATIONS

The following list contains the acronyms and abbreviations used in this report.

ARAR	Applicable or Relevant and Appropriate Requirement
ACGIH	American Conference of Governmental Industrial Hygienists
AOC	Area of Concern
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
BFB	Bromoflurobenzene
BRA	Baseline Risk Assessment
BZ	Breathing Zone
cc/min	cubic centimeters per minute
CDI	Chronic Daily Intake
CLP	Contract Laboratory Program (USEPA)
CNC	Charleston Naval Complex
COC	Chemical of Concern
COPC	Chemical of Potential Concern
CPSS	Chemical Present in Site Sample
DQO	Data Quality Objectives
E/A&H	EnSafe/Allen & Hoshall
ECAO	Environmental Criteria and Assessment Office (USEPA)
EPC	Exposure Point Concentration
FFI	Focused Field Investigation
ft.	Feet
GL	Ground Level
HEAST	Health Affects Assessment Summary Tables
HQ	Hazard Quotient
HI	Hazard Index
IAQ	Indoor Air Quality
ILCR	Incremental Lifetime Excess Cancer Risk
IRIS	Integrated Risk Information System
mm	millimeter
MW	Molecular Weight

LIST OF ACRONYMS AND ABBREVIATIONS (Continued)

NAVBASE	Naval Base Charleston
NCEA	National Center of Exposure Assessment
NOAEL	No Observable Adverse Effect Level
OSHA	Occupational Safety and Health Administration
% D	Percentage Difference
% RSP	Percent Relative Standard Deviation
ppbv	Parts per Billion, based on volume
PQL	Practical Quantitation Limit
QA/QC	Quality Assurance/Quality Control
RAGS	Risk Assessment Guidance for Superfund
RBC	Risk-Based Concentration
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RfD	Reference Dose
RFI	RCRA Facility Investigation
RME	Reasonable Maximum Exposure
RPD	Relative Percent Difference
RRF	Relative Response Factor
SCDHEC	South Carolina Department of Health and Environmental Control
SF	Slope Factor
SS_{ext}	Subslab (exterior)
SS_{int}	Subslab (interior)
SWMU	Solid Waste Management Unit
TLV	Threshold Limit Value
TOC	Total Organic Carbon
$\mu g/m^3$	micrograms per cubic meter
UCL	Upper Confidence Limit
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound

1.0 BACKGROUND

On January 1, 1994, Congress authorized the transfer of the Fleet and Mine Warfare Training Center buildings at Naval Base Charleston (NAVBASE) to the U.S. Department of State. The buildings are bounded by Dyess Avenue, Proteus Street, Bainbridge Avenue, and Holland Street.

In and around these buildings, several solid waste management units (SWMUs) and areas of concern (AOCs) are currently the subject of RCRA Facility Assessments (RFAs) and RCRA Facility Investigations (RFIs). Figure 1 locates the State Department buildings and the nearby SWMUs and AOCs. Of particular concern was SWMU 9 (Closed Landfill). These buildings are in Zone H, as defined in the *Comprehensive RFI Work Plan*. Based upon the location of these buildings, it was hypothesized that persons working in the acquired State Department buildings and others in the immediate area could be exposed to concentrations of airborne toxic chemicals that may adversely affect their health through carcinogenic and/or noncarcinogenic health effects.

To determine if this might be so, a focused field investigation (FFI) was conducted in two phases. This report describes the techniques used, presents the results, interprets the data collected, and presents a limited baseline risk assessment addressing inhalation of airborne contaminants. This report will be included as part of the final RFI report.

2.0 OBJECTIVES

The FFI was performed to determine if soil gas from landfill areas or other external sources infiltrated into various buildings in the Zone H. Indoor air where soil gas may have migrated and accumulated (from external sources) may have contained levels of contaminants which may pose human health risks. Phase I of the FFI was conducted to determine the presence or absence of gross contamination of volatile organic compounds (VOCs) at the Ground Level (GL) and Breathing Zone (BZ) areas in various buildings. To supplement data collection efforts, Phase II of the FFI extended indoor air sampling for VOCs to Sub-Slab Interior (SS_{int}) and Sub-Slab Exterior (SS_{ext}) building locations as well as resampling at GL and BZ areas. The intent of Phase II sampling was to determine whether the source of VOCs was external or internal to the buildings. In addition to an attempt to address the aforementioned goals, the results of the FFI were used as a planning tool to direct a more comprehensive sampling effort during the Zone H RFI as outlined in the Zone H RFI Work Plan. To the extent that data which meets Level III and Level IV Data Quality Objectives (DQOs) are generated, the results of the FFI are incorporated into a Human Health and Environment Risk Assessment for Zone H.

The three primary objectives of this FFI are stated as follows:

- To identify the presence or absence of indoor air contaminants [volatile organic compounds, semi-volatile organic compounds, and selected inorganic compounds (i.e. sulfur)].

- To determine if the indoor air contaminants quantified are emanating from the interior or exterior of the buildings.

- To determine any risks to human health from air contaminants having an external source.

The FFI scope of work was developed to meet the objectives outlined in Section 2.0. Resumes of key personnel involved in the scoping and work plan development phases of the FFI are provided in the Comprehensive RFI Work Plan for the Naval Base Charleston.

3.0 METHODOLOGY

Methods used to achieve the aforementioned objectives have included both building surveys and a dual-phased investigation employing indoor air quality (IAQ) surveys. Both IAQ surveys involved the collection of indoor air samples. The sampling methodology for samples taken was the USEPA Compendium Method (TO-14): *The Determination of Volatile Organic Compounds (VOCs) in Ambient Air Using SUMMA Passivated Canister Sampling and Gas Chromatographic Analysis*.

3.1 Building Surveys

Each building in the area of investigation was visually inspected during Phase I. The survey was conducted by EnSafe/Allen & Hoshall (E/A&H) engineers to identify and evaluate separated joints and cracks in floor slabs, cracked foundations and open utility chases that could provide pathways for soil gases to seep into buildings. Smoke tubes were used to verify air flow where floor cracks were observed. The survey included 94 suspect buildings at NAVBASE Charleston. The results of the building surveys are summarized in Section 3.2.3 and detailed in Appendix A. As a result of this investigation, eight structures such as personnel barracks, office buildings, training buildings, and retail stores were selected for inclusion in IAQ surveys. Figure 1 shows these buildings. Once identified, these structures were targeted for IAQ sampling. Unoccupied buildings, such as storage sheds and mechanical buildings, were not surveyed.

3.2 Indoor Air Quality Surveys — Phase I and Phase II

IAQ surveys were conducted in two distinct phases. Phase I was from February 10, 1994 through February 26, 1994, and Phase II was from November 8, 1994 through December 8, 1994. During Phase I, indoor air samples were taken in accordance with Method TO-14 to identify and quantify levels of volatile organic compounds present in the selected buildings. Phase II indoor air sampling was identical in technique, but it involved an augmentation of the sampling zones established in Phase I. The building survey described above served as the basis for selecting the buildings and specific sites within the buildings for which air samples were collected.

3.2.1 Sample Categories

There were four types of air samples collected during the Phase I and Phase II air surveys. The below described sample types are as follows:

1. Ground Level (GL).
2. Breathing Zone (BZ).
3. Sub-Slab Interior (SS_{int}).
4. Sub-Slab Exterior (SS_{ext}).

Three air samples were collected at each sample location over three consecutive days, excluding weekends and holidays.

GL samples were collected at cracks in the building's floor slab or walls during Phase I and Phase II of the IAQ survey. The purpose of GL samples was to provide a quantitative assessment of the "worst-case" indoor air contamination in areas believed to have the highest potential for soil gas infiltration.

During Phase I and Phase II of the IAQ survey, BZ samples were collected in the approximate breathing area of a typical worker, about 5 feet above the floor inside the building. The BZ samples were collected in potentially occupied areas over an eight hour period.

As part of Phase II, SS_{int} air samples were collected from sample points beneath the floor of the building, (i.e., the space between the ground and the structure of the building, or void space). These air samples were collected to identify any volatile contaminants emanating from underlying soil and/ or groundwater that might enter the buildings.

SS_{ext} air samples were collected from void space sample points accessed from outside of the building during Phase II of the IAQ survey. These samples were used to identify potential sources of volatile contaminants that may exist in subslab areas associated with underlying soil and/or groundwater that were not accessible from the building interior.

It should be noted that during Phase I, only GL and BZ sample types were collected.

In addition to these four types of air samples collected for building characterization, the following three types of QA samples were collected:

- **Background Samples** used to quantitatively characterize ambient concentrations of chemicals in the environment that have not been influenced by site-related activities.

- **Field Blanks** used to determine the existence and magnitude of potential contamination introduced during sampling, transport, or analysis.

- **Duplicate Samples** used to measure the reproduceability of sampling and analysis, or precision.

3.2.2 Sampling Methodology

As part of both phases of the survey, air samples were collected in accordance with USEPA Compendium Method TO-14. The subatmospheric pressure sampling mode was used during both phases. In essence, this involves ambient air being drawn by vacuum through a sampling train, which is comprised of components that regulate the rate and duration of sampling into a clean, pre-evacuated SUMMA passivated canister.

In preparation for subatmospheric sample collection in the SUMMA passivated canister, the canister was evacuated to 0.05 millimeters (mm) of mercury (Hg). When opened to the atmosphere (potentially) containing airborne contaminants to be collected, the differential pressure causes the sample to flow into the canister. This technique may be used to collect either grab samples or time-integrated samples taken through a flow-restrictive inlet. (e.g., critical orifice, mass flow controller).

The subatmospheric pressure TO-14 sampling train utilized for the IAQ surveys was consistent with section 7.1 of Method TO-14. The components of this sampling train were as follows:

1. A probe consisting of approximately 5 feet of chromatographic grade, stainless steel tubing.

2. A 6-liter, leak-free, stainless steel, passivated SUMMA canister.

3. A regulator/orifice calibrated for fixed flow rates.

An additional sampling train, identical to that described above, was designated solely for calibration purposes. Clean, laboratory-certified canisters were used for all field samples collected.

Once ready for field sampling, each canister was placed at the appropriate sample location, and the sampling train was assembled. To begin sampling, the canister valve (regulator/orifice) and vacuum pressure gauge were opened. For each sample, the vacuum in the canister was recorded in field sampling documents immediately prior to and upon completion of sample collection time period.

Flow rates for BZ samples collected during Phase I ranged from 6 to 12 cubic centimeters per minute (cc/min) of air, while BZ samples collected during Phase II ranged from 4 to 12 cc/min. Comparatively, flow rates for GL samples collected during Phase I ranged from 2 to 4 cc/min. The flow rate from subslab samples also ranged from 2 to 4 cc/min.

Part of the regulator/flow meter setup for both phases included a piece of stainless steel tubing which extended from the canister to the sample location. In the case of GL samples tubing extended down to a crack in the floor and for BZ samples tubing extended up to approximately 5 feet. SS_{int} samples were collected by placing a stainless steel sampling probe through a crack and sampling an air pocket under the building. SS_{ext} samples were collected by placing a sample canister adjacent to a building's exterior wall and running tubing through a space between the ground surface and the building's structure. The end of the tubing was shaped to bend up after going under the building to sample trapped pockets of air. It was believed that air trapped by the building's structure provided the best conditions for volatile soil gases to accumulate.

3.2.3 Sampling Approach/Locations

As part of the dual phase IAQ survey, samples were collected in eight buildings listed in increasing numerical order as Buildings: 36, NS84, 202, 643, 644, 645, 656 and 657. Within a facility, the primary factors in selecting sample locations were:

- GL samples were collected in areas believed to have the highest potential for soil gas infiltration, i.e., the most severe cracking.

- BZ samples were collected in areas of high occupancy and were at, or near, GL locations.

- SS_{int} samples were collected in close proximity to GL samples in some buildings to determine the source concentration of VOCs with a pathway into a building. These samples should provide an understanding of soil gas flow from external source to potential inhalation zones when compared with BZ and GL results.

- SS_{ext} samples were collected to help characterize VOC concentrations in places where soil gas vapors could be trapped. It is assumed that VOCs present beneath cracks in the building's structure will be diluted due to air movement either into or out of the building. Therefore, there were likely to be other sub-slab locations where VOC could reach higher concentrations. SS_{ext} samples were collected in order to identify areas beneath buildings where gaseous vapors could preferentially accumulate. Comparing SS_{int} to SS_{ext} provides additional insight into sub-slab VOC concentrations and the possible movement of VOCs into buildings.

Tables 1 through 8 list all Phase I and Phase II IAQ survey samples by building, sample collection dates, sample identification numbers, sample types [i.e., breathing zone (BZ), ground level (GL), sub-slab inside the building (SS_{int}), and/or sub-slab outside the building (SS_{ext})] collected, and IAQ survey phase.

Table 1
Phase I and Phase II
Sample Identification Numbers for Building 36[1]

Date	Location	Sample ID	Sample Type	Phase
12/01/94	Laundry Room - 2 feet from the point where the pipes penetrated the floor	036A1102F2	BZ	II
12/01/94	Laundry Room - at the point where the pipes penetrated the floor	036A1203F2	GL	II
12/01/94		036A1204F2	GL dup	II
12/01/94		036A1305F2	SS int	II
12/01/94	Crawl space beneath the building	036A1306[2]F2	SS ext	II
12/02/94	Laundry Room - 2 feet from the point where the pipes penetrated the floor	036A2102F2	BZ	II
12/02/94		036A2103F2	BZ dup	II
12/02/94	Laundry Room - at the point where the pipes penetrated the floor	036A2204F2	GL	II
12/02/94		036A2305F2	SS int	II

Table 1
Phase I and Phase II
Sample Identification Numbers for Building 36[1]

Date	Location	Sample ID	Sample Type	Phase
12/02/94	Crawl space beneath the building	036A2306F2	SS ext	II
12/03/94	Laundry Room - 2 feet from the point where the pipes penetrated the floor	036A3102F2	BZ	II
12/03/94	Laundry Room - at the point where the pipes penetrated the floor	036A3203F2	GL	II
12/03/94		036A3304F2	SS int	II
12/03/94	Crawl space beneath the building	036A3305F2	SS ext	II

Notes:
(1) Building 36 was dropped from the Phase I IAQ survey because of painting activities during the investigation.
(2) Sample suspect. Zero vacuum in canister at the end of the sample period.
BZ Breathing Zone
GL Ground Level
SSint Sub-slab (interior)
SSext Sub-slab (exterior)
dup Duplicate sample

Table 2
Phase I and Phase II
Sample Identification Numbers for Building NS84

Date	Location	Sample ID	Sample Type	Phase
2/17/94 - 2/18/94	Hallway, Immediately past the women's rest room and adjacent cabinets	NS840217-02	GL	I
2/18/94 - 2/21/94		NS840218-02	GL	I
2/21/94 - 2/22/94		NS840222-01	GL	I
2/17/94		NS840217-02	BZ	I
2/18/94		NS840218-01	BZ	I
2/22/94		NS840222-02	BZ	I
2/22/94 - 2/23/94		NS840222-02	GL dup	I
11/18/94	South side of Bldg. 84 near a transformer pad	NS84A1101F2	BZ	II
11/18/94		NS84A1202F2	GL	II
11/18/94		NS84A1303F2	SS ext	II

Table 2
Phase I and Phase II
Sample Identification Numbers for Building NS84

Date	Location	Sample ID	Sample Type	Phase
11/29/94	Hallway, Immediately past the women's rest room and adjacent cabinets	NS84A2202F2	BZ	II
11/29/94		NS84F4103F2	BZ dup	II
11/29/94		NS84A2204F2	GL	II
11/29/94	South side of Bldg. 84, near a transformer pad	NS842305F2	SS ext	II
11/30/94	Hallway. Immediately past the women's rest room and adjacent cabinets	NS84A3102F2	BZ	II
11/30/94		NS84A3203F2	GL	II
11/30/94	South side of Bldg. 84, near a transformer pad	NS84A3304F2	SS ext	II

Notes:
BZ Breathing Zone
GL Ground Level
SSint Sub-slab (interior)
SSext Sub-slab (exterior)
dup Duplicate sample

Table 3
Phase I and Phase II
Sample Identification Numbers for Building 202

Date	Location	Sample ID	Sample Type	Phase
2/14/94 - 2/15/94	Expansion joint, in hallway across from Room 117	2020214-01	GL	I
2/15/94 - 2/16/94		2020215-04	GL	I
2/15/94 - 2/16/94		2020215-04	GL dup	I
2/15/94 - 2/16/94		2020216-04	GL	I
2/14/94 - 2/15/94	Room 117	2020214-03	GL	I
2/15/94 - 2/16/94		2020215-03	GL	I
2/16/94 - 2/17/94		2020216-03	GL	I

Table 3
Phase I and Phase II
Sample Identification Numbers for Building 202

Date	Location	Sample ID	Sample Type	Phase
2/14/94	Expansion joint, hallway ASW wing	2020214-02	BZ	I
2/15/94		2020215-02	BZ	I
2/16/94		2020216-02	BZ	I
11/08/94	Room 117	202A1101F2	BZ	II
11/08/94	Expansion joint, hallway across from Room 117	202A1202F2	GL	II
11/08/94	Several feet away from GL samples	202A1303F2	SS ext	II
11/09/94	Room 117	202A2101F2	BZ	II
11/09/94	Several feet away GL samples	202A2302F2	SS ext	II
11/09/94	Expansion joint, across from Room 117	202A2203F2	GL	II
11/10/94	Room 117	202A3101F2	BZ	II
11/10/94	Expansion joint, across from Room 117	202A3202F2	GL	II
11/10/94	Several feet away from GL samples	202A3303F2	SS ext	II
11/10/94	Room 117	202A3404F2	GL dup	II

Notes:
BZ Breathing Zone
GL Ground Level
SSint Sub-slab (interior)
SSext Sub-slab (exterior)
dup Duplicate sample

Table 4
Phase I and Phase II
Sample Identification Numbers for Building 643[1][2]

Date	Location	Sample ID	Sample Type	Phase
2/10/94 - 2/11/94	Room 19	6430210-01	GL	I
2/11/94 - 2/12/94	Room 19	6430211-02	GL	I
2/12/94 - 2/13/94	Room 19	6430211-03	GL	I
2/10/94	Room 19	6430210-02	BZ	I

Table 4
Phase I and Phase II
Sample Identification Numbers for Building 643[1][2]

Date	Location	Sample ID	Sample Type	Phase
2/11/94	Room 19	6430211-01	BZ	I
2/12/94	Room 19	6430212-01	BZ	I
2/10/94 - 2/11/94	Middle of Mines Bay Room	6430210-03	BZ	I
11/14/94	Room 19 - Center of the entrance into the MNS Handling Area	643A1102F2	BZ	I
11/14/94	Room 19 - Along the left wall of the MNS Handling Area	643A1203F2	GL	II
11/14/94	Room 19 - Along the left wall of the MNS Handling Area	643A1304F2	SS int.	II
11/14/94	East of the southwest corner of Building 643	643A1305F2	SS ext.	II
11/15/94	East of the southwest corner of Building 643	643A2302F2	SS ext.	II
11/15/94	Room 19 - Center of the entrance to the MNS Handling Area	643A2103F2	BZ	II
11/15/94	Room 19 - Center of the entrance	643A2204F2	GL	II
11/15/94	Room 19 - Along the left wall of the MNS Handling Area	643A2305F2	SS int	II
11/16/94	East of the Southwest corner of Building 643	643A3302F2	SS ext	II
11/16/94	Room 19 - Center of the entrance	643A3103F2	BZ	II
11/16/94	Room 19 - Along the left wall of the MNS Handling Area	643A3204F2	GL	II
11/16/94	Room 19 - Center of the entrance	643A3305F2	SS int	II

Notes:

(1) See Section 3.2.3.4 for list of chemicals stored in this room.
(2) During Phase II of the IAQ surveys, diesel engines in the room where BZ, GL and SS_{int} samples were collected, may have been in operation.

BZ Breathing Zone
GL Ground Level
SS_{int} Sub-slab (interior)
SS_{ext} Sub-slab (exterior)
dup Duplicate sample

Table 5
Phase I and Phase II
Sample Identification Numbers for Building 644

Date	Location	Sample ID	Sample Type	Phase I
2/17/94 - 2/18/94	Collected along the crack that ran the length of the bowling alley between lanes 24 and 25	6440217-01	GL	I
2/18/94 - 2/19/94		6440218-01	GL	I
2/18/94 - 2/19/94		6440218-01	GL dup	I
2/22/94 - 2/23/94		6440222-01	GL	I
2/17/94		6440217-02	BZ	I
2/18/94		6440218-02	BZ	I
2/22/94		6440222-02	BZ	I
11/14/94	Collected along the crack between lanes 24 and 25	644A1106F2	BZ	II
11/14/94		644A1207F2	GL	II
11/14/94		644A1308F2	SS int	II
11/14/94		644A1309F2	SS ext	II
11/15/94(1)	Collected along the crack between lanes 24 and 25	644A2206F2	GL	II
11/15/94(1)		644A2107F2	BZ	II
11/15/94(1)		644A2308F2	SS int	II
11/15/94(1)	Collected 13 feet east of the SW corner of Bldg. 644	644A2309F2	SS ext	II
11/16/94	Collected along the crack between lanes 24 and 25	644A3106F2	BZ	II
11/16/94		644A3207F2	GL	II
11/16/94		644A3308F2	SS int	II
11/16/94	Collected 13 feet east of the SW corner of Bldg. 644	644A3309F2	SS ext	II
11/16/94		644A3410F2	SS ext dup	II

Notes:

(1) The Fire Fighter Training School directly across the street from Building 644 was in use every day samples were collected. The Fire Fighter Training School is located less than 200 yards (estimated) from Building 644 with no other structures in between. Due to foggy weather and stagnant air, samples were most likely to have been adversely impacted on 11/15/94; smoke from the school engulfed samples collected outside of the building.

BZ Breathing Zone
GL Ground Level
SS_{int} Sub-slab (interior)
SS_{ext} Sub-slab (exterior)
dup Duplicate sample

Table 6
Phase I and Phase II
Sample Identification Numbers for Building 645[1]

Date	Location	Sample ID	Sample Type	Phase
2/14/94 - 2/15/94	Room 105	6450214-01	GL	I
2/15/94 - 2/16/94	Room 105	6450215-01	GL	I
2/16/94 - 2/17/94	Room 105	6450216-01	GL	I
2/16/94 - 2/17/94	Room 105	6450216-01	GL dup	I
2/14/94	Room 104	6450214-03	BZ	I
2/15/94	Room 104	6450215-02	BZ	I
2/16/94	Room 104	6450216-02	BZ	I
11/08/94	Room 103- 6 feet from the entrance into Room 104	645A1104F2	BZ	II
11/08/94	Room 104 - immediately to the right of the entrance to Room 105	645A1205F2	GL	II
11/08/94	Room 104 - immediately to the right of the entrance to Room 105	645A1306F2	SS int	II
11/08/94	Central location under Building 645	645A1307F2	SS ext	II
11/09/94	Central location under Building 645	645A2304F2	SS ext	II
11/09/94	Room 104 - immediately to the right of the entrance to Room 105	645A2205F2	GL	II
11/09/94	Room 104 - immediately to the right of the entrance to Room 105	645A2306F2	SS int	II
11/09/94	Room 103- 6 feet from the entrance into Room 104	645A2107F2	BZ	II
11/09/94	Room 103- 6 feet from the entrance into Room 104	645A4008F2	BZ dup	II
11/10/94	Room 103- 6 feet from the entrance into Room 104	645A3105F2	BZ	II
11/10/94	Room 104 - immediately to the right of the entrance to Room 105	645A3206F2	GL	II

Table 6
Phase I and Phase II
Sample Identification Numbers for Building 645[1]

Date	Location	Sample ID	Sample Type	Phase
11/10/94	Room 104 - immediately to the right of the entrance to Room 105	645A3307F2	SS int	II
11/10/94	Central location under Building 645	645A3308F2	SS ext	I

Note:

1 During Phase II of the IAQ surveys, work was being performed on the roof in the area all three days. In addition, the diesel engine in Room 105 was operated for two hours during the first day of Phase I sampling.

BZ Breathing Zone
GL Ground Level
SSint Sub-slab (interior)
SSext Sub-slab (exterior)
dup Duplicate sample

Table 7
Phase I and Phase II
Sample Identification Numbers for Building 656

Date	Location	Sample ID	Sample Type	Phase
2/23/94 - 2/24/94	Center of the warehouse along the crack	6560223-01	GL	I
2/24/94 - 2/25/94	Warehouse interior near store's entrance	6560224-01	GL	I
2/25/94 - 2/26/94		6560225-01	GL	I
2/23/94 - 2/24/94	Warehouse along the crack	6560223-02	GL	I
2/24/94 - 2/25/94		6560224-02	GL	I
2/25/94 - 2/26/94		6560225-02	GL	I
2/23/94 - 2/24/94	Store area, uniforms, dressing room	6560223-05	GL	I
2/24/94 - 2/25/94		6560224-05	GL	I
2/25/94 - 2/26/94		6560225-05	GL	I
2/23/94 - 2/24/94	Center of the warehouse along the crack	6560223-06	GL dup	I
2/24/94	Store area near bicycle display	6560224-06	BZ dup	I
2/25/94	Warehouse interior near store entrance	6560225-06	GL dup	I

Table 7
Phase I and Phase II
Sample Identification Numbers for Building 656

Date	Location	Sample ID	Sample Type	Phase
2/23/94	Store area, uniforms, dressing room	6560223-04	BZ	I
2/24/94		6560224-04	BZ	I
2/25/94		6560225-04	BZ	I
2/23/94	Store area near bicycle display	6560223-03	BZ	I
2/24/94		6560224-03	BZ	I
2/25/94		6560225-03	BZ	I
2/23/94	Warehouse interior near store's entrance	6560223-07	BZ	I
2/24/94		6560224-07	BZ	I
2/25/94		6560225-07	BZ	I
2/24/94	Store Area- Near display of bicycles	6560224-06	BZ	I
12/06/94	Store Area - Near display bicycles	656A1202F2	GL_1	II
12/06/94		656A1103F2	BZ_1	II
12/06/94	Sub-slab, west side of the building	656A1304F2	SS ext_1	II
12/06/94	Sub-slab, east side of the building	656A1305F2	SS ext_2	II
12/06/94	Warehouse interior	656A1106F2	BZ_2	II
12/06/94		656A1207F2	GL_2	II
12/06/94		656A1308F2	SS int	II
12/07/94	Sub-slab, west side of the building	656A2302F2	SS ext_1	II
12/07/94		656A2403F2	SS ext_1 dup	II
12/07/94	Sub-slab, east side of the building	656A2304F2	SS ext_2	II
12/07/94	Warehouse interior	656A2305F2	SS int	II
12/07/94		656A2106F2	BZ_2	II
12/07/94		656A2207F2	GL_2	II
12/07/94	Store Area- Near display of bicycles	656A2208F2	GL_1	II
12/07/94		656A2109F2	BZ_1	II
12/07/94		656A2110F2	BZ_1 dup	II
12/08/94	Sub-slab, east of the building	656A3302F2	SS ext_1	II

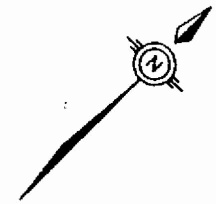
Table 7
Phase I and Phase II
Sample Identification Numbers for Building 656

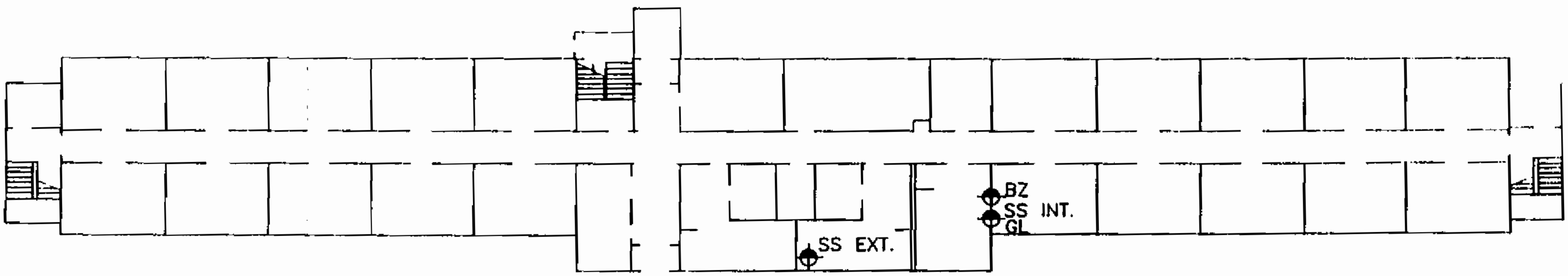
Date	Location	Sample ID	Sample Type	Phase
12/08/94	Sub-slab, west of the building	656A3303F2	SS ext_2	II
12/08/94	Warehouse interior	656A3104F2	BZ_2	II
12/08/94		656A3305F2	SS int	II
12/08/94		656A3206F2	GL_2	II
12/08/94	Store Area - Near display of bicycles	656A4207F2	GL_2 dup	II
12/08/94		656A3108F2	BZ_1	II
12/08/94		656A3209F2	GL_1	II

Notes:
BZ_1 Breathing Zone in the store area near the bicycle display
BZ_2 Breathing Zone in the warehouse
GL_1 Ground Level in the store area near the bicycle display
GL_2 Ground Level in the warehouse
SS_{int} Sub-slab (interior)
SS_{ext1} Sub-slab (exterior) east of the building
SS_{ext2} Sub-slab (exterior) west of the building
dup Duplicate sample

Table 8
Phase and Phase II
Sample Identification Numbers for Building 657

Date	Location	Sample ID	Sample Type	Phase
2/23/94 - 2/24/94	Middle of dance floor	6570223-01	GL	I
2/24/94 - 2/25/94		6570224-01	GL	I
2/25/94 - 2/26/94		6570225-01	GL	I
2/23/94		6570223-02	BZ	I
2/24/94		6570224-02	BZ	I
2/25/94		6570225-02	BZ	I
11/18/94	35 feet in front of the entrance into the dance club and 2 feet to the right	A1204	GL	II
11/18/94		A1105	BZ	II





LEGEND

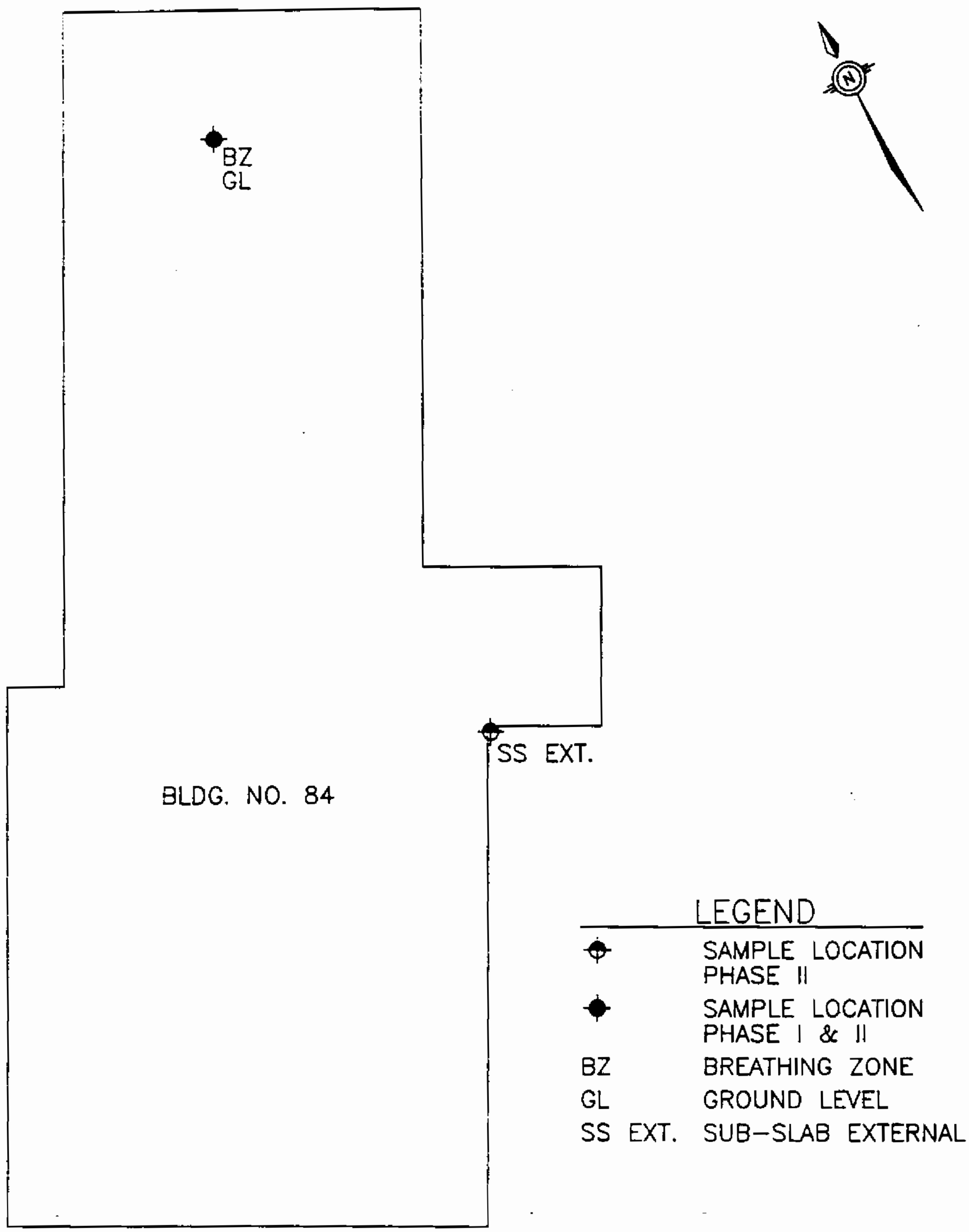
⌖	SAMPLE LOCATION PHASE II
BZ	BREATHING ZONE
GL	GROUND LEVEL
SS INT.	SUB-SLAB INTERNAL
SS EXT.	SUB-SLAB EXTERNAL

NOT TO SCALE

FOCUSED FIELD INVESTIGATION
NAVAL BASE CHARLESTON
CHARLESTON, S.C.

FIGURE 2
BUILDING 36
BARRACKS
AIR SAMPLE LOCATIONS

DWG DATE: 1/26/95 | DWG NAME: 029B39

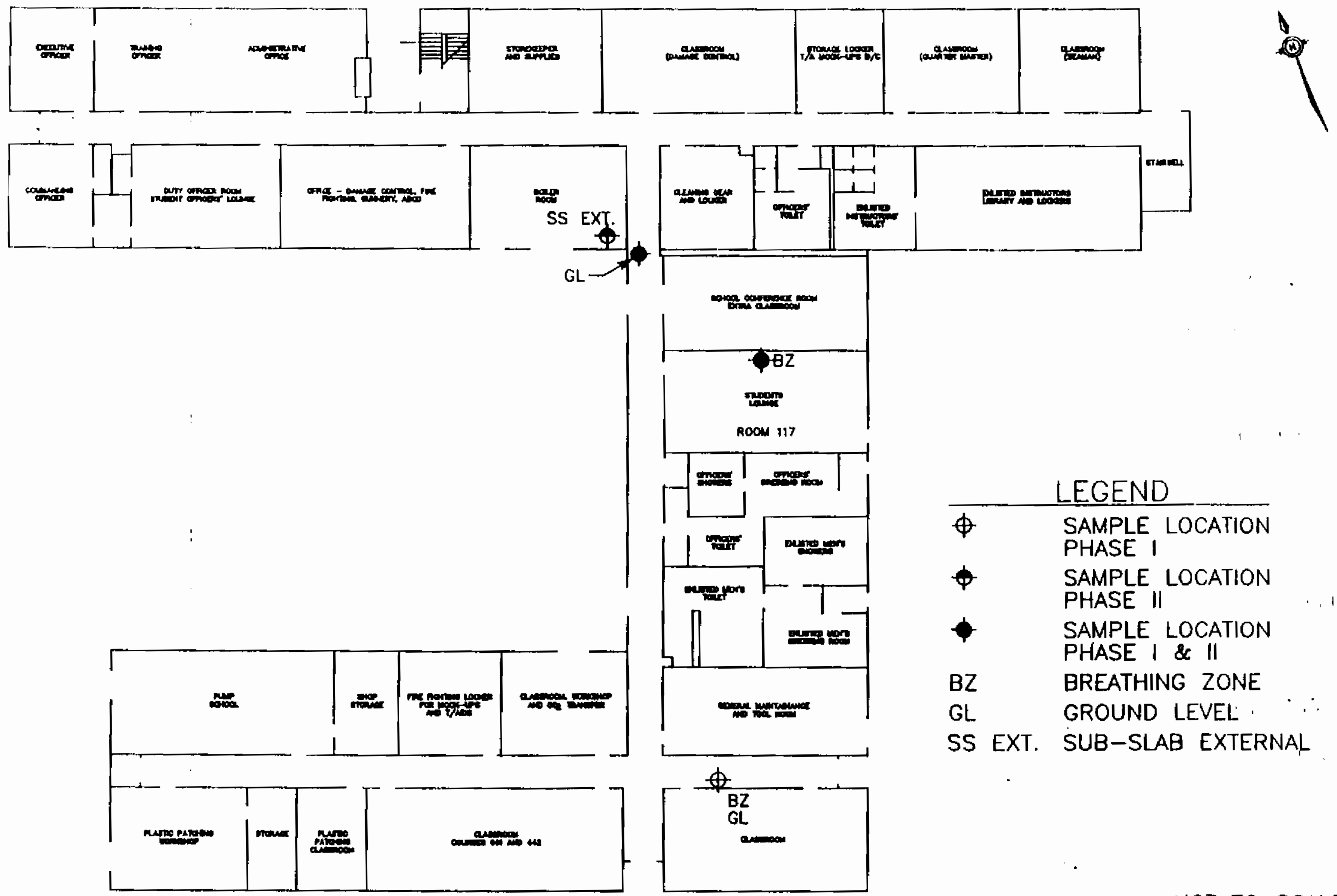


NOT TO SCALE

FOCUSED FIELD INVESTIGATION
NAVAL BASE CHARLESTON
CHARLESTON, S.C.

FIGURE 3
BUILDING NS 84
NAVAL SECURITY
AIR SAMPLE LOCATIONS

DWG DATE: 1/26/95 | DWG NAME: 029B84

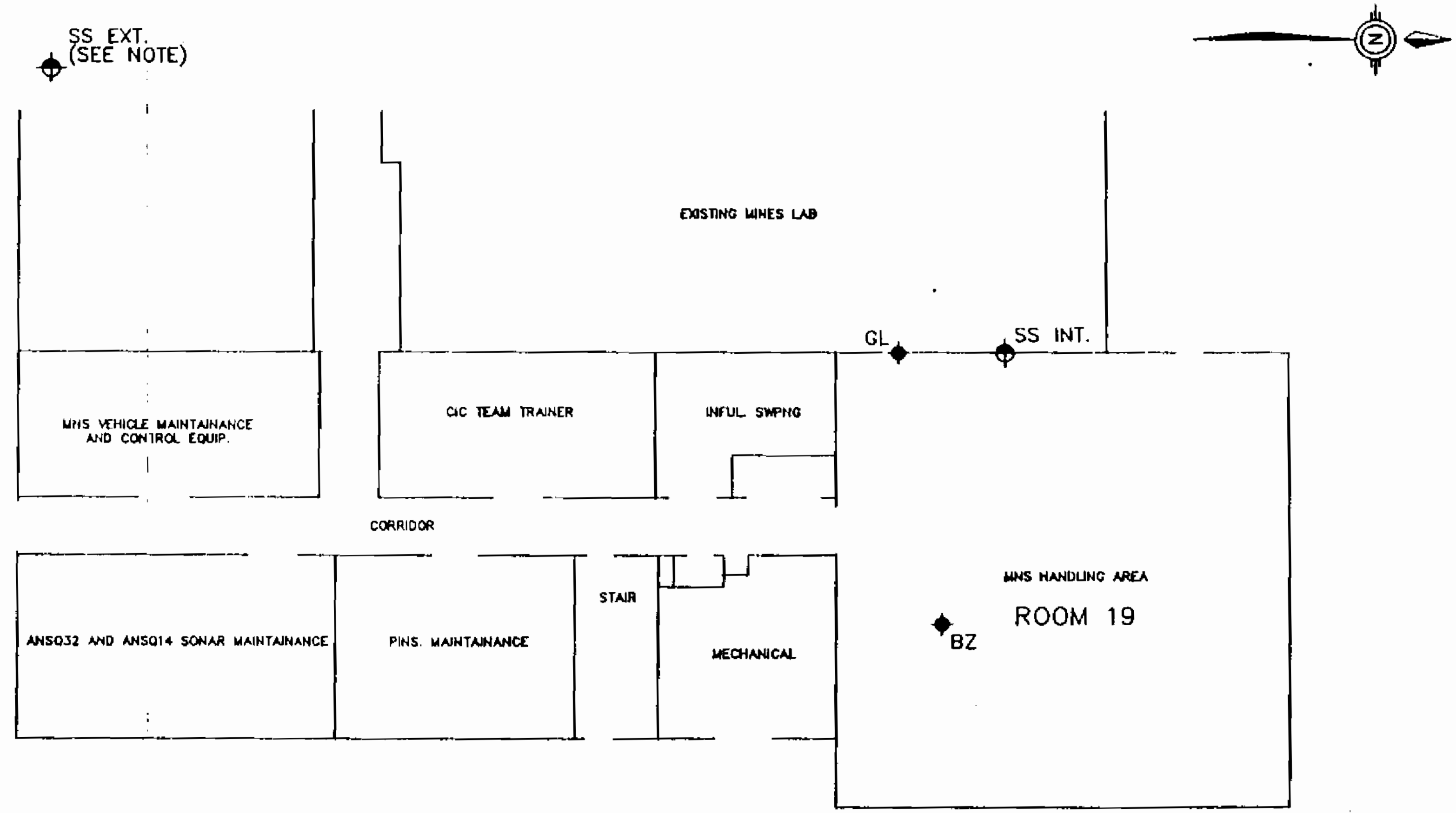


NOT TO SCALE

FOCUSED FIELD INVESTIGATION
NAVAL BASE CHARLESTON
CHARLESTON, S.C.

FIGURE 4
BUILDING 202
AIR SAMPLE LOCATIONS

DWG DATE: 1/26/95 | DWG NAME: 029B202



NOTE: SAMPLE LOCATION OFF PLAN. LOCATION IS APPROXIMATELY 3 FEET NORTH AND 1 FOOT WEST OF THE SOUTHWEST CORNER OF THE BUILDING.

NOT TO SCALE

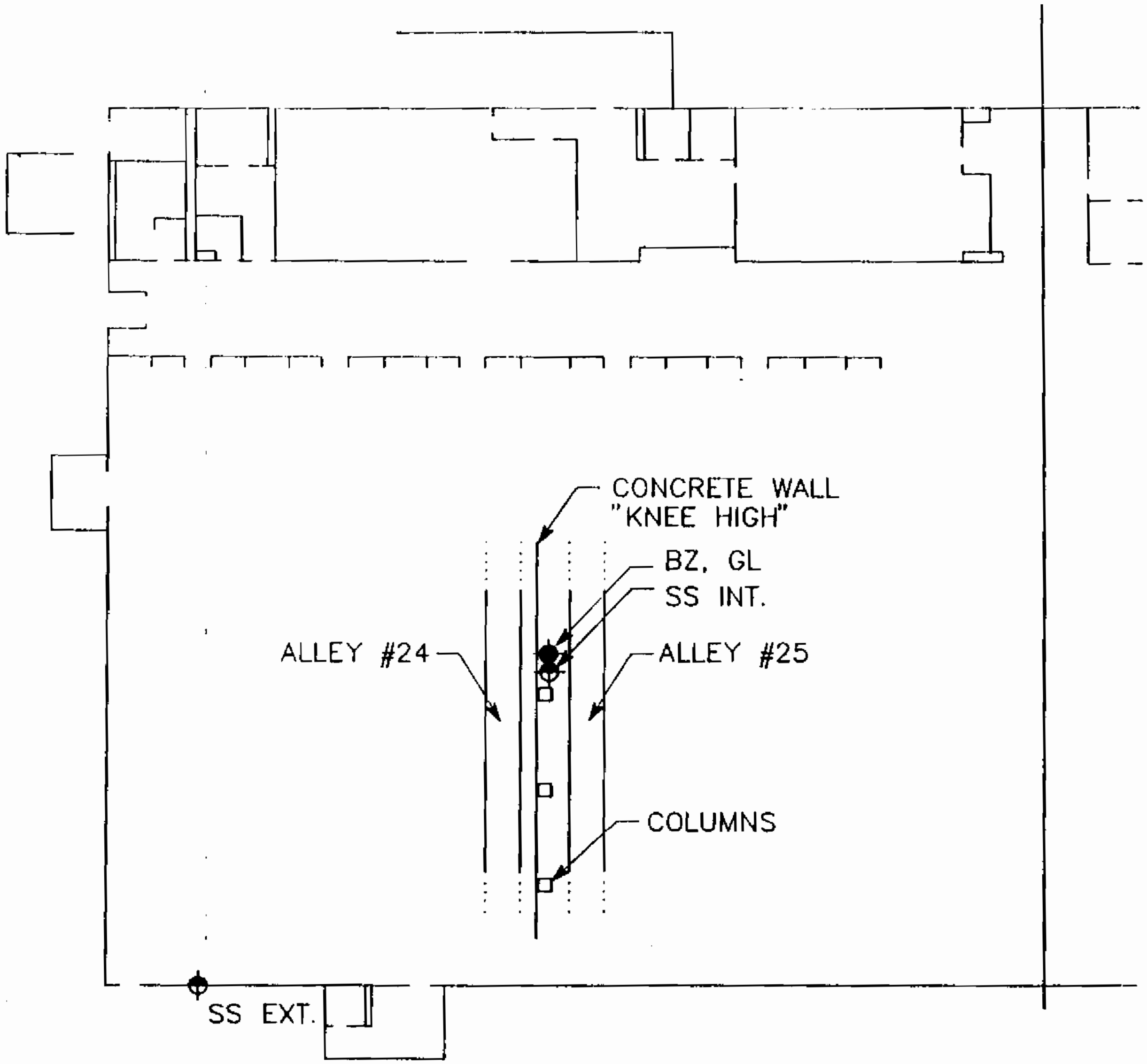
LEGEND

⌖	SAMPLE LOCATION PHASE II
◆	SAMPLE LOCATION PHASE I & II
BZ	BREATHING ZONE
GL	GROUND LEVEL
SS INT.	SUB-SLAB INTERNAL
SS EXT.	SUB-SLAB EXTERNAL

FOCUSED FIELD INVESTIGATION
NAVAL BASE CHARLESTON
CHARLESTON, S.C.

FIGURE 5
BUILDING 643
PARTIAL FLOOR PLAN
AIR SAMPLE LOCATIONS

DWG DATE: 1/26/95 | DWG NAME: 029B643



LEGEND

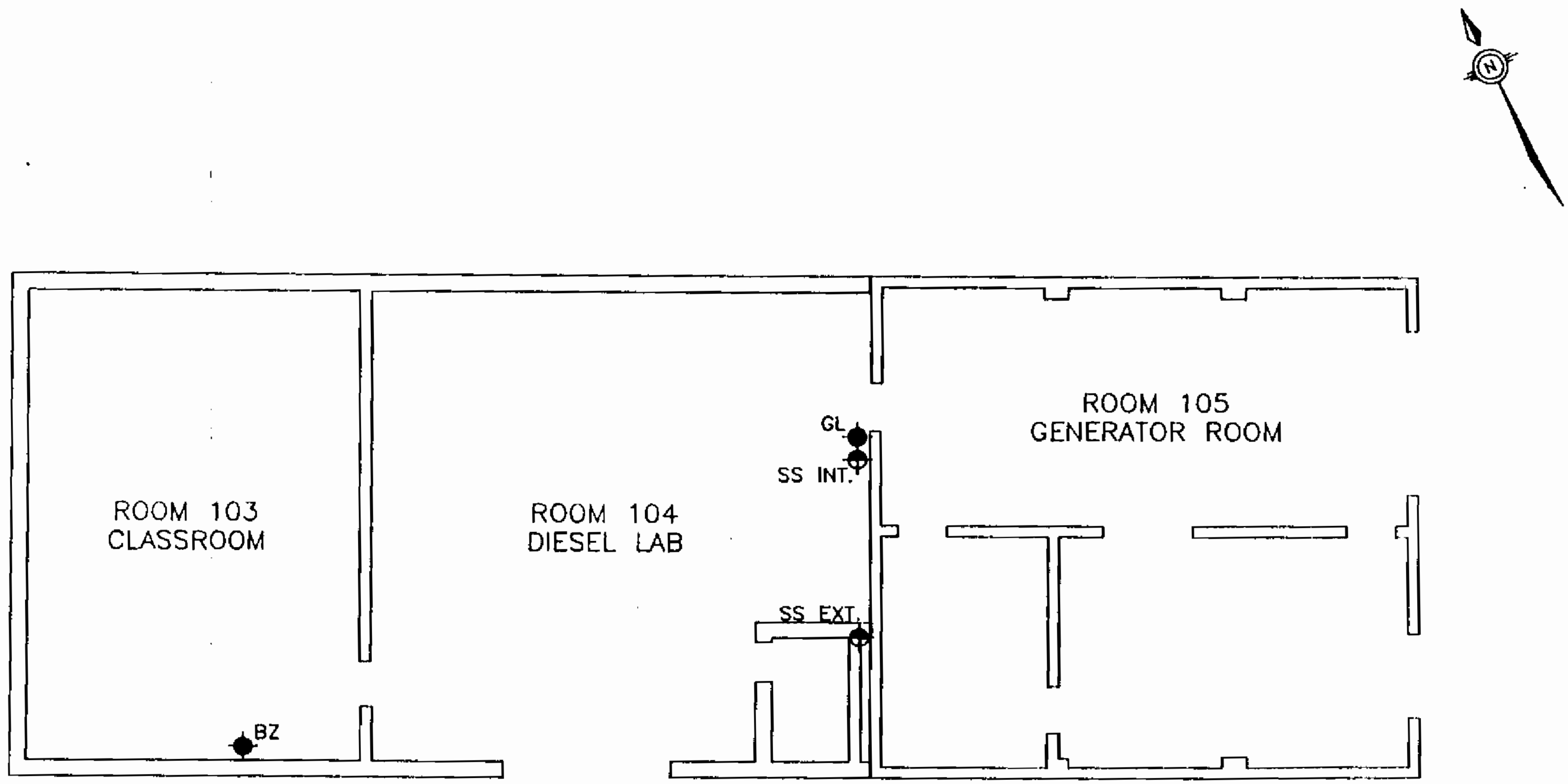
⌖	SAMPLE LOCATION PHASE II
●	SAMPLE LOCATION PHASE I & II
BZ	BREATHING ZONE
GL	GROUND LEVEL
SS INT.	SUB-SLAB INTERNAL
SS EXT.	SUB-SLAB EXTERNAL

NOT TO SCALE

FOCUSED FIELD INVESTIGATION
NAVAL BASE CHARLESTON
CHARLESTON, S.C.

FIGURE 6
BUILDING 644
BOWLING ALLEY ADDITION
AIR SAMPLE LOCATIONS

DWG DATE: 2/1/95 | DWG NAME: 026B644



LEGEND

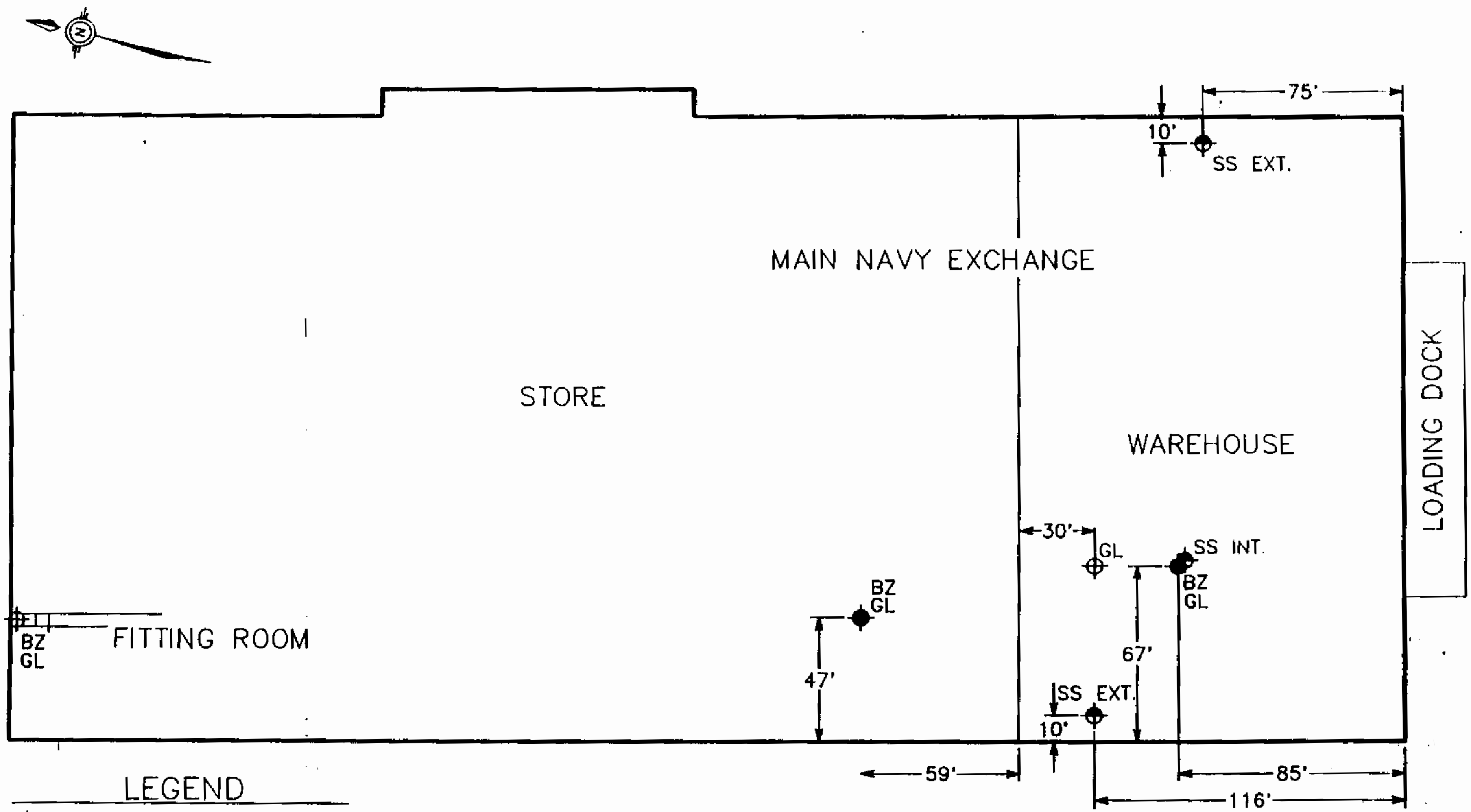
⌖	SAMPLE LOCATION PHASE II
◆	SAMPLE LOCATION PHASE I & II
BZ	BREATHING ZONE
GL	GROUND LEVEL
SS INT.	SUB-SLAB INTERNAL
SS EXT.	SUB-SLAB EXTERNAL

NOT TO SCALE

FOCUSED FIELD INVESTIGATION
NAVAL BASE CHARLESTON
CHARLESTON, S.C.

FIGURE 7
BUILDING 645
AIR SAMPLE LOCATIONS

DWG DATE: 1/26/95 | DWG NAME: 029B645



LEGEND

⌖	SAMPLE LOCATION PHASE I
⯐	SAMPLE LOCATION PHASE II
●	SAMPLE LOCATION PHASE I & II
BZ	BREATHING ZONE
GL	GROUND LEVEL
SS INT.	SUB-SLAB INTERNAL
SS EXT.	SUB-SLAB EXTERNAL

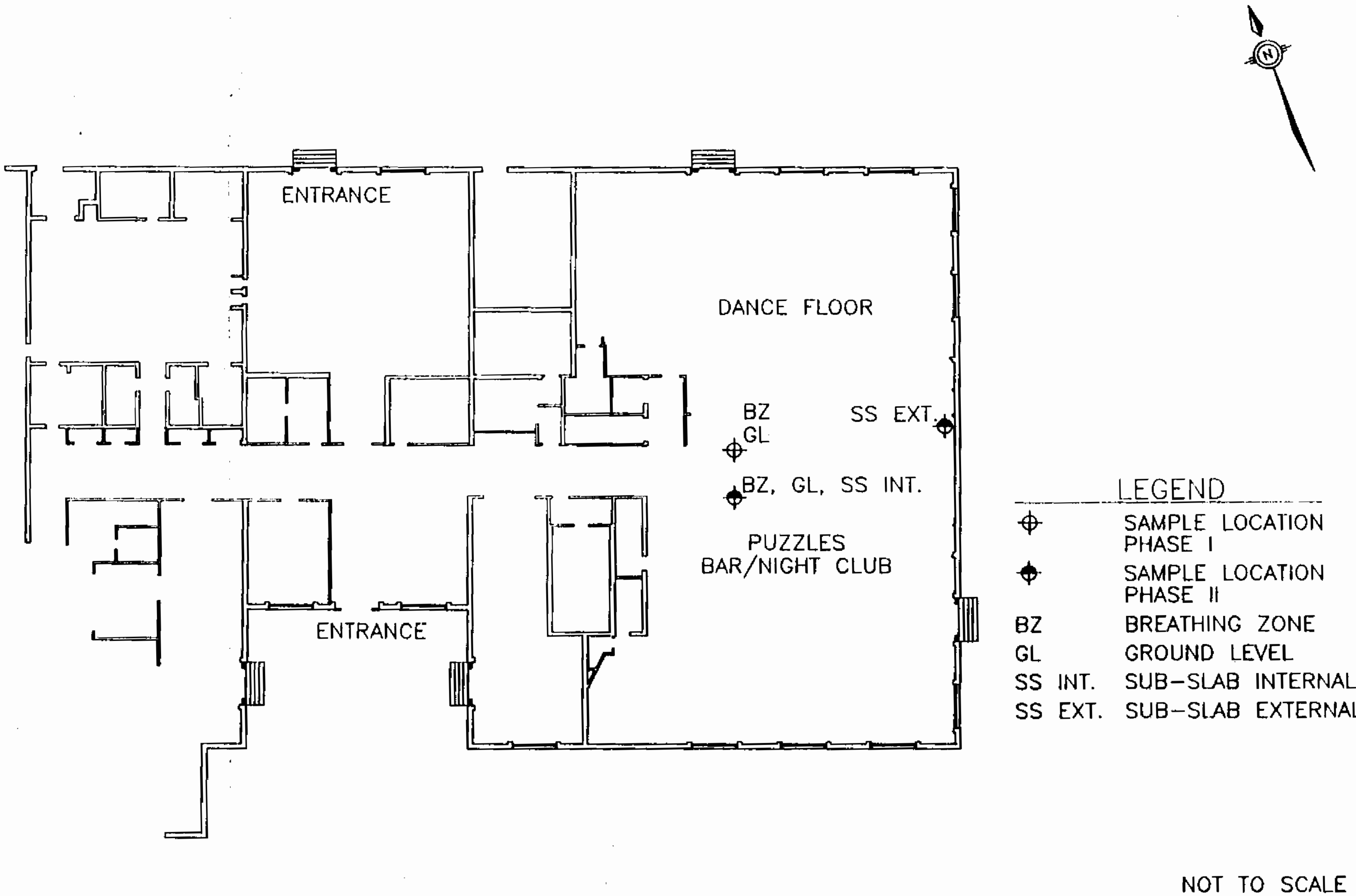
NOTE: MEASUREMENTS ARE APPROXIMATE

NOT TO SCALE

FOCUSED FIELD INVESTIGATION
NAVAL BASE CHARLESTON
CHARLESTON, S.C.

FIGURE 8
BUILDING 656
NAVAL EXCHANGE BUILDING
AIR SAMPLE LOCATIONS

DWG DATE: 1/26/95 | DWG NAME: 029B656



FOCUSED FIELD INVESTIGATION
NAVAL BASE CHARLESTON
CHARLESTON, S.C.

FIGURE 9
BUILDING 657 ENLISTED CLUB
PRACTICAL FLOOR PLAN
AIR SAMPLE LOCATIONS

DWG DATE: 1/26/95 | DWG NAME: 029B657

During Phase I of the IAQ survey, Building 36 was dropped from the survey because the building was being painted at the time of sample collection. Fumes from the paint would have invalidated the GL and BZ air samples collected in the building.

During Phase II, GL and SS_{int} samples were collected where the pipes penetrated the floor of the laundry room (as illustrated in Figure 2), 53 feet east of the south side entrance to the building and 10 feet in from the southern exterior wall. BZ samples were located two feet further in than the GL and SS_{int} samples. The SS_{ext} samples were collected in the crawl space under the building. These samples were 123 feet west of the southeast corner of the building. The sample tubing was extended approximately 5 feet under the building. (Note: The crawl space contains potential asbestos-containing pipe insulation that had fallen from pipes. Persons should not enter the crawl space without proper personal protective equipment.)

3.2.3.2 Building NS 84 — Naval Security

Building NS 84 was a high security area with limited access. No chemical storage areas were observed during the building survey, and it was also noted that smoking is prohibited in Building NS 84. Given the function of this building, no toxic chemicals were expected; although small quantities of cleaning products were likely present.

During Phase I and Phase II of the IAQ survey, both BZ and GL samples were collected in the hallway just past the women's restroom and adjacent to file cabinets. Because carpeting covered the floor, suspected cracks could not be confirmed. Samples were collected near a doorway where the floor carpeting could be lifted to expose the floor. Air was suspected to be infiltrating the building through a crack beneath the carpet. A smoke tube confirmed the movement of air through the crack.

During Phase II sampling, no SS_{int} samples were collected since the crack was not accessible. SS_{ext} samples were collected on the south side of the building, near a transformer pad. Sample locations are shown on Figure 3.

3.2.3.3 Building 202 — Fleet Mine and Warfare Instruction Building

During the Phase I and Phase II IAQ surveys samples were collected from three locations in Building 202. BZ samples were collected in Room 117. Room 117 was the occupied area nearest the cracks observed in the hallway. GL and SS_{int} samples were collected in a hallway by Room 117 and SS_{ext} samples were collected several feet away from the GL samples, as shown on Figure 4. The hallway location was selected because of cracks observed associated with expansion joints. No smoking was allowed in this building.

The following observations made during Phase I sampling accurately reflect conditions present during Phase II of the IAQ surveys.

Hallway by Room 117. A large crack was observed in the expansion joint between two sections of the building. The crack was up to 1-inch wide and ran up the walls. While the crack was suspected of extending the width of the floor, a metal plate covered the floor, precluding confirmation of the crack's extent. Soil gases, as observed using smoke tubes, infiltrated into this portion of the building more slowly than at other GL sample locations. However, due to persons walking in the hallway, air entering the building was well mixed and could easily and rapidly reach a person's breathing zone.

Room 117. The room had tile floors, cinder block walls, and wood paneling. No chemicals were stored near the sampling locations. Standard floor cleaning products and other maintenance chemicals were routinely used in this area.

3.2.3.4 Building 643 — Fleet and Mine Warfare Building

Room 19. A 17,000 gallon pool in this room is used for conducting training exercises. Samples were collected from two locations in Room 19, which was 2,400 square feet and may have up to 8 persons working in it. Along the northeast wall, there was a bay door. This door was reportedly almost always closed and during a typical week was opened for 30 minutes or less. This room was a designated smoking area.

A crack observed along the northwest side of this room was approximately 27 feet long and up to one-quarter inch wide. Using a smoke tube, E/A&H observed air flowing into the room through the crack in the floor.

Samples were collected from the following locations:

- BZ sample. From the center of the entrance into the center of the room, the GL sample was 8 feet forward and 9 feet to the right.
- GL sample. From the center of the entrance into the center of the room, the GL sample was 8 feet forward and along the left wall.
- SS_{int}. From the center of the entrance into the center of the room, the GL sample was 19 feet forward and along the left wall.
- SS_{ext}. 3 feet north and 1 foot east of the southwest corner of the building.

Phase II BZ and GL samples were collected in the same location as BZ and GL samples collected in the first round of sampling. Sample locations are presented on Figure 5.

Chemical Inventory The following chemicals were present during a chemical inventory conducted by E/A&H in February 1994 during the first round of sampling of the FFI. Three 55-gallon drums were stored in this room; two drums were full of lubricating oils and one was one third full of waste oil. All three had closed spigots and bungs. Two flammable chemical storage cabinets were in this room. One cabinet was located on the southeast side of the room and the other was on the southwest side of the room. Materials stored in these cabinets included:

- Lubricating oils - 15 gallons
- Rubber cement - 1 gallon
- Trichloroethylene*
- Isopropyl alcohol*
- Spray paint*
- Electrical coatings containing methylethylketone, toluene and acetone*
- Anti-seize compounds*
- Penetrating oil*
- Glass cleaner*

* Less than one gallon observed at the time samples were collected.

3.2.3.5 Building 644 — Bowling Alley

This bowling alley has 48 lanes, pool tables, and arcade games. A large crack, estimated in places to exceed one-quarter inch in width, ran the length of the bowling alley between lanes 24 and 25. During Phase II of the IAQ surveys, BZ, GL and SS_{int} samples were collected at this crack, just past the third building column. All three samples were collected at the same location.

Phase II BZ and GL samples were collected in the same location as BZ and GL samples collected during Phase I sampling. SS_{ext} samples were collected 13 feet east of the southwest corner of the building, i.e., the side of the building nearest to the firefighter training center. Sample locations are shown on Figure 6.

No smoking was allowed in the area during sampling. The absence of smokers over the entire sampling event cannot, however, be confirmed. Except for general cleaning, waxing and polishing materials, no chemicals were used or stored in this building. Waxes and other treatment compounds used on the bowling alleys reportedly contain mineral spirits.

The Fire Fighter Training Center conducted training exercises less than 100 yards from the bowling alley. During these exercises, Navy personnel attacked controlled diesel fires. As a result of local weather conditions, smoke from the fire training exercises visibly engulfed the SS_{ext} sample and the adjacent quality control duplicate sample.

3.2.3.6 Building 645 — Fleet Mine Warfare Training Center Diesel Engine Laboratory and Classroom Building

Building 645 is a small building containing three classrooms in which smoking is not allowed. The building was floored with concrete slab and had cinder block walls. Room 104 had floor tiles. It was unoccupied during the Phase II of the IAQ surveys. Phase II BZ and GL samples were collected in the same location as BZ and GL samples collected during Phase I of the sampling. Sample locations are shown on Figure 7.

Diesel Lab, Room 104. In Room 104, a crack up to one-quarter inch wide ran the length of the wall that was common to the generator room (Room 105). GL and SS_{int} samples were collected in Room 104, right of the entrance to Room 105 as part of Phase II IAQ sampling. A flammable storage locker was present in the diesel lab; small quantities of several products were stored in this locker including: isopropyl alcohol, lubricating oil, grease, scouring powder, and silicone grease.

These products were at least 15 feet from the BZ samples (in Room 103) and 30 feet from the GL and SS_{int} samples. No degreasing solvents were observed, but are likely to have been used or stored here in the past. Standard floor cleaning products and other maintenance chemicals are periodically used in this building.

During Phase I, two GL samples and one BZ sample were collected in the warehouse, in addition to two BZ samples and one GL sample in the retail area. A seventh sample, a duplicate, was collected alongside the other samples each day.

During Phase II, a BZ, GL and SS_{int} sample were collected at the same location in the warehouse each day. This location was 85 feet north of the southern exterior wall, and 67 feet east of the western wall. A BZ and GL sample were collected near the display of bicycles, 59 feet north of the warehouse and 47 feet east of the western wall i.e., entrance by the gardening supplies. One SS_{ext} location was 116 feet north of the southwest corner of the building and 10 feet under the building. This location was under the warehouse section of the building, not far from the garden shop. The second SS_{ext} was on the east side of the building, 75 feet north of the southeast corner of the building. Sample locations are shown on Figure 8.

Numerous products are stored in the warehouse that could or do contain potentially hazardous volatile constituents including paints and cleaning products. In addition, many products contain fragrances and other volatile compounds which may not be toxic but can be detected by the TO-14 sampling and analysis methodology.

3.2.3.8 Building 657 — Recreational Facility

This building consists of several recreational areas including a sports bar, dance club, food court, pub and pool table area, and an arcade. The area of concern was the dance floor in Puzzles Night Club. Inside this area, cracks were observed along construction joints where a wall was removed to increase the size of the dance floor.

While cracks as wide as one-quarter inch were observed during the first round of sampling, these large cracks had been filled before Phase II. The remaining smaller cracks were not wide enough to permit SS_{int} sample collection. As a result of the larger cracks being filled, Phase II BZ and GL samples were collected approximately 10 feet from where they were collected in the first round. BZ and GL samples were collected 35 feet forward of the entrance into Puzzles and 2 feet to the right (south). SS_{ext} samples were collected approximately midcenter of the exterior wall closest to the commissary, and the sample tubing extended 5 feet under the building. Sample locations are shown on Figure 9.

Smoking was allowed in the area where the samples were collected, however, the club was closed during the sample collection period. Except for cleaning products including ammonia, chemicals were not used or stored in this building.

3.2.4 Quality Assurance and Quality Control

Key QA/QC measures regarding the sampling equipment and objectives are discussed below. The analytical laboratory's standard operating procedure for Method TO-14 is included as Appendix C.

All SUMMA canisters used for this project were received from the manufacturer with a certification that they met Method TO-14 requirements. Canisters, previously used in this project, were also certified by the supplier as meeting TO-14 requirements. To meet TO-14 requirements, scientific grade air is introduced into the canister and remains in the canister for at least 24 hours. This air is then analyzed and none of the compounds of interest may be present at the limit of quantification, 0.2 ppbv. These certifications are available for review and are currently retained by the supplier.

Flow regulators with stainless steel tubing for sample collection were calibrated as a unit before and after collecting a sample. The flow regulators were calibrated in the field with a stop watch and a soap bubble burette. A SUMMA canister was dedicated for this process so that sampling canisters were only opened once they were in place, and had a calibrated regulator and tubing in place.

Once a canister was sampling, a seal was placed over the inlet valve so that if someone tampered with the inlet valve, it would be apparent to sampling personnel.

One QA/QC objective was to have field duplicate (or co-located) samples comprise at least 10% of all samples collected. A field duplicate sample is a second sample collected at the same time, place and approximate flow rate as another sample. For this project, 10 out of 96 samples or 10% of all samples were field duplicate samples. Background and zero air samples were not included in the number of samples. Blind field duplicate were submitted to the analytical laboratory the same as other samples so that the laboratory was unaware that they were analyzing a co-located sample.

The analytical laboratory had its own set of QA/QC procedures for TO-14 including sample spikes (system monitoring compound analysis). The laboratory calibrated the gas chromatograph/mass spectrometer before and after sample analysis and computed percent recovery of known standards. These procedures are discussed in detail in Section 3.2.5.

During Phase I of the IAQ survey, three background samples were collected outside Building 12A. As part of Phase II of the IAQ survey, 15 background samples were collected in the vacant parking lot close to Building 656. Table 9 lists the sample collection date, sample identification number, sample type, and canister identification number for the Phase I and Phase II background samples.

Five field blank samples were collected as part of the Phase II of the IAQ survey. Table 10 lists the sample collection date, sample identification number, and canister identification number for the zero air (i.e., field blank) samples. Results and implications of the field blanks are provided in Section 3.2.5.

Table 9
Phase I and Phase II
Sample Identification Numbers for Background Samples

Date	Location	Sample ID	Sample Type	Phase
2/23/94	Outside of Building 12A	12A0223-01	BZ	I
2/24/94		12A0224-01	BZ	I
2/25/94		12A0225-01	BZ	I
11/08/94	Parking lot next to Bldgs. 623 and 656	623A1108	BZ	II
11/09/94		623A4109	BZ	II
11/10/94		623A3109	BZ	II
11/14/94		623A4101	BZ	II
11/15/94		623A5101	BZ	II
11/16/94		623A6101	BZ	II
11/18/94		623A7107	BZ	II
11/29/94		623A8101	BZ	II
11/30/94		623A9101	BZ	II
12/01/94		036A1101	BZ	II
12/02/94		036A2101	BZ	II
12/05/94		036A3101	BZ	II
12/06/94		624A4101	BZ	II
12/07/94		624A5101	BZ	II
12/08/94		624A6101	BZ	II

Notes:
BZ Breathing Zone

Table 10
Phase I and Phase II
Sample Identification Numbers for Zero Air Samples

Date	Sample ID	Sample Type
11/08/94	12AA4009	Zero Air Blank
11/15/94	12AF410	Zero Air Blank
11/18/94	12AF4008	Zero Air Blank

Table 10
Phase I and Phase II
Sample Identification Numbers for Zero Air Samples

Date	Sample ID	Sample Type
11/29/94	12AF4109	Zero Air Blank
12/08/94	12AF4110	Zero Air Blank

Notes:
These samples were collected in order to identify potential exogenous contaminant sources.

3.2.5 Air Sample Data Validation

The purpose of the data validation was to verify that the method dictated QA/QC procedures were performed and that quality control requirements were achieved. Due to uncertainty associated with Phase I data, Phase II sampling and analysis strategies were developed incorporating more comprehensive QA/QC evaluation methods in order to facilitate a more rigorous data validation process. Phase I data were formerly reported in the Draft FFI report issued July 1994. Phase II data were subjected to full validation as supported by available field and laboratory QA information. All validated Phase II data are provided in Appendix B.

The data were evaluated based on the following method dictated QA/QC parameters:

- Holding Times
- System Monitoring Compound Analysis
- Blank Analysis
- Bromofluorobenzene (BFB) Tuning Performance
- Instrument Calibration
- Internal Standard Analysis
- Precision (Duplicates)

The USEPA document, *Compendium of Methods For The Determination Of Toxic Organic Compounds in Ambient Air* (June 1988), Method TO-14, defines quality control criteria that the laboratory must meet; however, these criteria do not address data evaluation from a user's perspective.

General evaluation criteria are available in the United States Environmental Protection Agency Contract Laboratory Program's *National Functional Guidelines for Organic Data Review*, February 1994 (Functional Guidelines). It should be noted that while these guidelines present 'good laboratory' GC/MS practice, in general, they have not been specifically proven for Method TO-14. Accordingly, data qualifiers presented below should be used with discretion.

According to the Functional Guidelines, when the quality control parameters do not fall within the specific method guidelines, the data evaluator annotates or "flags" the corresponding compounds for samples in which the deficiencies were found. This method was used for the validation of Charleston Zone H Focused Field Investigation data. The following flags were used to annotate data exhibiting laboratory and/or field deficiencies or problems:

U *Undetected* - The analyte was analyzed for but not detected or found in an sample at a concentration less than five times the corresponding blank concentration; the associated value shown is the Practical Quantitation Limit (PQL).

J *Estimated value* - One or more quality control parameters were outside control limits, or the concentration exceeded the method detection limit but was less than the PQL.

UJ *Undetected and Estimated* - The analyte was analyzed for but not detected above the listed estimated PQL; the PQL is estimated because one or more quality control parameters were outside control limits.

R *Unusable Data* - One or more quality control parameters grossly exceeded control limits.

Where necessary, these flags were affixed to data presented in Appendix B.

Holding times were evaluated. All samples contained within this data set were analyzed within the designated holding time of 30 days.

System monitoring compounds (surrogates) are not specified in TO-14. However, the laboratory introduced 3 internal standards including, 4-bromofluorobenzene into each sample prior analysis. While TO-14 does not require "classical" surrogate recovery data, for purposes of assessing sample recovery in the laboratory sample analyses process, the laboratory provided the 4-bromofluorbenzene analysis results or recoveries for each sample.

Nineteen out of 126 samples had recovery of the internal standard 4-bromofluorobenzene outside control limits. Two of the 19 recoveries exceeded the upper control limits. In these instances, all positive results were flagged as estimated (J) and the non-detected results were accepted without qualification. Seventeen of the 19 recoveries were less than the control limits and the results were flagged as estimated (J) for positive results and (UJ) for non-detects.

Blanks are clean samples that are processed and analyzed as any other sample to determine the existence and magnitude of potential contamination introduced from exogenous sources during sampling, transport, or analysis. Potential contamination may be introduced by improper decontamination of sampling equipment, by improper sampling procedures, by dirty canisters, during canister transport, and by laboratory contamination. Blanks are treated with the same procedures as samples from the field. Laboratory (method) blanks are prepared from zero-air in the laboratory and processed along with the samples through each sample preparation and analysis step. Field blanks are collected using zero-air and sampling equipment analogous to that used to collect the samples.

When chemicals are found in samples and laboratory blanks analyzed within the same 12-hour period, or in samples and field blanks collected the same week, the usability of the data depends on the judgement of the reviewer and the origin of the blank. According to the Functional

Guidelines, a sample result should not be considered positive unless the concentration of the compound in the sample exceeds 10 times the amount in <u>any</u> blank (i.e., method blank, trip blank, zero air, etc.) for common laboratory contaminants (i.e. methylene chloride) or five times the amount for other constituents. These are referred to as *action levels.*

Blank action levels were compared to sample values. 1,2,4-Trichlorobenzene and meta-and para-xylenes were detected in various method blanks. Only two samples associated with the method blanks were affected in their respective sample. The data were 'U' qualified as non-detect based on the method blank comparison.

The following contaminants were identified in various field blanks and qualified as non-detect (U) due to concentrations less than the respective action level: 1,1,1-trichloroethane was negated in 15 samples, 1,2,4-trichlorobenzene in one sample, 1,2,4-trimethylbenzene in 18 samples, 1,3,5-trimethylbenzene in four samples, 1,4-dichlorobenzene and toluene in 20 samples, 1-ethyl-4-methylbenzene and styrene in 14 samples, benzene in 39 samples, dichlorodifluoromethane and meta-and para-xylenes in 19 samples, ethylbenzene in seven samples, methyl chloride in 24 samples, methylene chloride in 73 samples, and trichlorofluoromethane and o-xylene in 16 samples.

BFB tuning performance checks are performed to ensure appropriate mass resolution, identification, and sensitivity. All ion abundances are normalized to m/z 95, the nominal base peak.

All BFB tuning performance checks in this data set were within the specified control limits.

Initial and continuing calibrations of the instruments with standards are used to check that the instrument is capable of producing acceptable qualitative and quantitative data for the analytes on the target compound list. These analyses are supplemented with periodic laboratory control spike and spike duplicate analyses to ensure that the analytical system continues to produce results of acceptable quality.

An initial calibration is performed to check the performance of the instrument at the beginning of the analytical run and to establish a linear calibration curve. The initial calibration is verified by calculating the relative response factor (RRF) and the percent relative standard deviation (%RSD) for each compound. An RRF less than 0.05 or a %RSD greater than 30 percent were designated outside the quality control limits for the initial calibration.

In all initial calibrations for styrene, the RRF was less than 0.050 and the %RSD was greater than 30.0 percent. All results for styrene were flagged as unusable (R) for non-detected results and estimated (J) for positive results.

Continuing calibration standards are run periodically to check the daily performance of the instrument and to establish the 12-hour RRF on which the quantitations are based. The initial calibration is verified by calculating the RRF and the percent difference (%D) for each compound. An RRF less than 0.05 or a %D greater than 25 percent were designated outside the quality control limits for the continuing calibration.

Benzyl chloride, chloroethane, methyl chloride, 1-ethyl-4-methylbenzene, hexachlorobutadiene, styrene, 1,2,4-trichlorobenzene, trichloroethylene, and trichlorofluoromethane exceeded the 25% control limit in various continuing calibrations. These compounds were flagged as estimated (J) for positive results and (UJ) for non-detected results in the associated samples.

Internal standards performance ensures that instrument sensitivity and response are stable during the analysis of each individual standard. Internal standards were performed with each sample. The area of each internal standard for the reported results were all within -50% and +100% of the area of the internal standards in the associated calibration.

Duplicate samples are analyzed to evaluate data precision, which is a measure of the reproduceability of the analysis. The relative percent difference (RPD) between the sample and the duplicate sample results is calculated. According to the TO-14 method, the RPD should not exceed 20% for sample and duplicate values greater than five times the detection limit.

Field duplicates are analyzed to evaluate sampling precision. The RPDs for toluene and trichlorofluoromethane exceeded the 20% control limit in field duplicates N84A2202F2 and N85F4103F2. 1,4-Dichlorobenzene, methyl chloride, and methylene chloride exceeded the 20% control limit in field duplicates 202A3202F2 and 202A3404F2. Methylene chloride and styrene exceeded the 20% control limit in field duplicates 645A2107F2 and 645A4008F2. Styrene, toluene, and trichlorofluoromethane exceeded the 20% control limit in field duplicates 644A3309F2 and 644A3410F2. 1,4-Dichlorobenzene, methylene chloride, and trichlorofluoromethane exceeded the 20% control limit in field duplicates 657A3206F2 and 657A3207F2. 1,4-Dichlorobenzene and toluene exceeded the 20% control limit in field duplicates 036A1203F2 and 036A1204F2. Methylene chloride and trichlorofluoromethane exceeded the 20% control limit in field duplicates 036A2102F2 and 036A2103F2. 1,1,1-Trichloroethane, methylene chloride, tetrachloroethylene, trichlorotrifluoroethane, and meta- and para-xylenes exceeded the 20% control limit in field duplicates 656A2109F2 and 656A2110F2. 1,1,1-Trichloroethane and toluene exceeded the 20% control limit in field duplicates 656A3206F2 and 656A4207F2. There were no compounds to exceed the 20% control limit in field duplicates 656A2302F2 and 656A2403F2. These compounds were not flagged because separate SUMMA canisters were used collecting these samples.

The following list shows the compounds that exceeded 20% of their control limit referenced by the corresponding sample ID's:

N84A2202F2	toluene and trichlorofluoromethane
N85F4103F2	toluene and trichlorofluoromethane
202A3202F2	1,4-dichlorobenzene, methyl chloride, and methylene chloride
202A3404F2	1,4-dichlorobenzene, methyl chloride, and methylene chloride
645A2107F2	methylene chloride and styrene
645A4008F2	methylene chloride and styrene
644A3309F2	styrene, toluene, and trichlorofluoromethane
644A3410F2	styrene, toluene, and trichlorofluoromethane
657A3206F2	1,4-dichlorobenzene, methylene chloride, and trichlorofluoromethane
657A3207F2	1,4-dichlorobenzene, methylene chloride, and trichlorofluoromethane
036A1203F2	1,4-dichlorobenzene and toluene
036A1204F2	1,4-dichlorobenzene and toluene
036A2102F2	methylene chloride and trichlorofluoromethane
036A2103F2	methylene chloride and trichlorofluoromethane
656A2109F2	1,1,1-trichloroethane, methylene chloride, tetrachloroethylene, trichlorotrifluoroethane, and meta- and para-xylenes
656A2110F2	1,1,1-trichloroethane, methylene chloride, tetrachloroethylene, trichlorotrifluoroethane, and meta- and para-xylenes
656A3206F2	1,1,1-trichloroethane and toluene
656A4207F2	1,1,1-trichloroethane and toluene
656A2302F2	none
656A2403F2	none

Methylene chloride exceeded the 20% control limit in the laboratory duplicate sample 036A1101F2. No qualification of the data was made because methylene chloride was previously negated as a result of blank contamination.

4.0 NATURE AND EXTENT OF AIRBORNE CONTAMINATION

4.1 IAQ Survey — Phase I and Phase II

Phase I of the IAQ survey was performed to quantify concentrations of airborne contaminants (breathing zone and ground level) in each building. Carbon dioxide concentrations were monitored to evaluate the ventilation systems within the buildings and provide a qualitative means of assessing whether the building environment would facilitate volatile compound accumulation to unhealthy levels.

Phase II of the IAQ survey supplemented indoor air results obtained during the first phase of the survey and identified and quantified any sub-slab sources of airborne contaminants inside the buildings. All Phase II data is presented in Appendix B of this document.

During Phase I data reduction, all chlorofluorocarbons were grouped under the generic category, *Freon*. This generic category is used in the description of Phase I data throughout Section 4.0. Phase II results are presented on a compound-specific basis. Compounds detected during Phase II which fit the generic category included dichlorodifluoromethane, trichlorofluoromethane, trichlorotrifluoroethane and 1,2-dichlorotetrafluoroethane.

In the following sections, the results of the IAQ survey including Phase I carbon dioxide monitoring are discussed separately for each building. If a chemical was detected in the original sample and the corresponding duplicate, the higher concentration was used to represent the detection.

The determination of an exterior source was based on a comparison of the contaminants detected in exterior sub-slab samples to the contaminants detected inside the buildings surveyed. For the purpose of this assessment, a potential external source was assumed to exist for any contaminant detected in both the external sub-slab sample and indoor sample for one building.

4.2 Building 36

As shown in Table 11, eleven chemicals were detected in Building 36 Phase II samples: 1,1,1-trichloroethane, 1,4-dichlorobenzene, benzene, chloromethane, dichlorodifluoromethane, methylene chloride, styrene, toluene, trichlorofluoromethane, meta- and para- xylenes, and chloroform. At Building 36, Phase I data collected during painting activities were determined to be invalid for the purposes of this investigation. Phase I data for Building 36 are not presented in this document. The distribution of compounds observed during Phase II is discussed in the following sections on a sample type-specific basis. Table 11 also shows corresponding sample locations, type, identification number, phase, and sample date for each detection reported during the IAQ surveys.

4.2.1 Distribution of Chemicals in the Breathing Zone

Phase I

No Phase I data are available for Building 36. This building was being painted during the sampling period.

Phase II

BZ samples were collected in the Building 36 laundry room, 2 feet from the pipes penetrating the floor. 1,4,-Dichlorobenzene, chloromethane, dichlorodifluoromethane, toluene, and trichlorofluoromethane were detected in BZ samples 036A1102F2, 036A2102F2, and 036A3102 (each of which correspond to the sample dates as discussed above). Benzene and styrene were detected in the second sample listed above, and methylene chloride was detected in the second and third samples. 1,1,1-Trichloroethane was detected in the first sample, and meta- and para-xylene were detected in the third.

4.2.2 Distribution of Chemicals in the Ground Level

Phase I

No Phase I data are available for Building 36.

Table 11

Indoor Air Quality Assessment

Chemicals Detected In and Around Building 36

Charleston Naval Complex

Charleston, South Carolina

SAMPLE LOCATION	SAMPLE TYPE	ENSAFE ID	PARAMETER	(ug/m3)	SAMPLING PHASE	DATE
	BZ	036A1102F2	1,1,1-Trichloroethane	2.9	2	12/1/94
laundry room 2' from pipes penetrating floor	BZ	036A3102F2	1,4-Dichlorobenzene	29.2	2	12/3/94
	BZ	036A1102F2	1,4-Dichlorobenzene	37.9	2	12/1/94
	BZ	036A2102F2	1,4-Dichlorobenzene	394.4	2	12/2/94
	BZ	036A2102F2	Benzene	0.7	2	12/2/94
	BZ	036A3102F2	Chloromethane	1.1	2	12/3/94
	BZ	036A2102F2	Chloromethane	0.8	2	12/2/94
	BZ	036A1102F2	Chloromethane	0.6	2	12/1/94
	BZ	036A3102F2	Dichlorodifluoromethane	2.4	2	12/3/94
	BZ	036A1102F2	Dichlorodifluoromethane	2.2	2	12/1/94
	BZ	036A2102F2	Dichlorodifluoromethane	14.2	2	12/2/94
	BZ	036A2103F2	Methylene chloride	2.4	2	12/2/94
	BZ	036A3102F2	Methylene chloride	1.8	2	12/3/94
	BZ	036A2102F2	Styrene	1.7	2	12/2/94
	BZ	036A3102F2	Toluene	1.7	2	12/3/94
	BZ	036A1102F2	Toluene	1.3	2	12/1/94
	BZ	036A2102F2	Toluene	1.8	2	12/2/94
	BZ	036A2102F2	Trichlorofluoromethane	15.7	2	12/2/94
	BZ	036A3102F2	Trichlorofluoromethane	5.9	2	12/3/94
	BZ	036A1102F2	Trichlorofluoromethane	4.2	2	12/1/94
	BZ	036A3102F2	m+p-Xylenes	1.6	2	12/3/94
	GL	036A1204F2	1,1,1-Trichloroethane	2.9	2	12/1/94

Table 11
Indoor Air Quality Assessment
Chemicals Detected In and Around Building 36
Charleston Naval Complex
Charleston, South Carolina

SAMPLE LOCATION	SAMPLE TYPE	ENSAFE ID	PARAMETER	(ug/m3)	SAMPLING PHASE	DATE
laundry room where pipes penetrate floor	GL	036A2204F2	1,4-Dichlorobenzene	40.6	2	12/2/94
	GL	036A3203F2	1,4-Dichlorobenzene	13.3	2	12/3/94
	GL	036A1203F2	1,4-Dichlorobenzene	9.0	2	12/1/94
	GL	036A2204F2	Chloroform	1.6	2	12/2/94
	GL	036A3203F2	Chloroform	2.7	2	12/3/94
	GL	036A3203F2	Chloromethane	0.7	2	12/3/94
	GL	036A1203F2	Chloromethane	0.47	2	12/1/94
	GL	036A2204F2	Chloromethane	0.50	2	12/2/94
	GL	036A1203F2	Dichlorodifluoromethane	1.8	2	12/1/94
	GL	036A2204F2	Dichlorodifluoromethane	4.1	2	12/2/94
	GL	036A3203F2	Dichlorodifluoromethane	2.0	2	12/3/94
	GL	036A2204F2	Methylene chloride	1.0	2	12/2/94
	GL	036A3203F2	Methylene chloride	0.9	2	12/3/94
	GL	036A2204F2	Toluene	0.8	2	12/2/94
	GL	036A1204F2	Toluene	1.0	2	12/1/94
	GL	036A3203F2	Toluene	1.0	2	12/3/94
	GL	036A2204F2	Trichlorofluoromethane	3.5	2	12/2/94
	GL	036A1203F2	Trichlorofluoromethane	2.1	2	12/1/94
	GL	036A3203F2	Trichlorofluoromethane	3.6	2	12/3/94
	GL	036A3203F2	m+p-Xylenes	1.0	2	12/3/94
	SSext	036A3305F2	1,4-Dichlorobenzene	9.8	2	12/3/94
sub-slab; crawl space beneath building	SSext	036A2306F2	1,4-Dichlorobenzene	3.4	2	12/2/94

Table 11
Indoor Air Quality Assessment
Chemicals Detected In and Around Building 36
Charleston Naval Complex
Charleston, South Carolina

SAMPLE LOCATION	SAMPLE TYPE	ENSAFE ID	PARAMETER	(ug/m3)	SAMPLING PHASE	DATE
	SSext	036A1306F2	1,4-Dichlorobenzene	4.1	2	12/1/94
	SSext	036A1306F2	Benzene	0.7	2	12/1/94
	SSext	036A2306F2	Chloroform	6.4	2	12/2/94
	SSext	036A3305F2	Chloroform	17.3	2	12/3/94
	SSext	036A3305F2	Chloromethane	0.6	2	12/3/94
	SSext	036A1306F2	Chloromethane	0.6	2	12/1/94
	SSext	036A3305F2	Dichlorodifluoromethane	1.8	2	12/3/94
	SSext	036A1306F2	Dichlorodifluoromethane	1.7	2	12/1/94
	SSext	036A2306F2	Dichlorodifluoromethane	2.2	2	12/2/94
	SSext	036A3305F2	Methylene chloride	1.0	2	12/3/94
	SSext	036A2306F2	Methylene chloride	0.8	2	12/2/94
	SSext	036A1306F2	Toluene	1.0	2	12/1/94
	SSext	036A2306F2	Trichlorofluoromethane	2.4	2	12/2/94
	SSext	036A3305F2	Trichlorofluoromethane	3.4	2	12/3/94
	SSext	036A1306F2	Trichlorofluoromethane	1.9	2	12/1/94
	SSint	036A1305F2	1,1,1-Trichloroethane	3.2	2	12/1/94
sub-slab; laundry room where pipes penetrate floor	SSint	036A2305F2	1,4-Dichlorobenzene	5.7	2	12/2/94
	SSint	036A1305F2	1,4-Dichlorobenzene	7.5	2	12/1/94
	SSint	036A3304F2	1,4-Dichlorobenzene	6.5	2	12/3/94
	SSint	036A2305F2	Chloroform	1.9	2	12/2/94
	SSint	036A3304F2	Chloroform	4.6	2	12/3/94
	SSint	036A2305F2	Chloromethane	0.50	2	12/2/94

Table 11
Indoor Air Quality Assessment
Chemicals Detected In and Around Building 36
Charleston Naval Complex
Charleston, South Carolina

SAMPLE LOCATION	SAMPLE TYPE	ENSAFE ID	PARAMETER	(ug/m3)	SAMPLING PHASE	DATE
	SSint	036A3304F2	Chloromethane	0.5	2	12/3/94
	SSint	036A2305F2	Dichlorodifluoromethane	3.2	2	12/2/94
	SSint	036A3304F2	Dichlorodifluoromethane	2.0	2	12/3/94
	SSint	036A1305F2	Dichlorodifluoromethane	1.8	2	12/1/94
	SSint	036A3304F2	Methylene chloride	7.3	2	12/3/94
	SSint	036A2305F2	Methylene chloride	3.4	2	12/2/94
	SSint	036A2305F2	Toluene	1.3	2	12/2/94
	SSint	036A3304F2	Toluene	1.5	2	12/3/94
	SSint	036A2305F2	Trichlorofluoromethane	4.4	2	12/2/94
	SSint	036A3304F2	Trichlorofluoromethane	4.9	2	12/3/94
	SSint	036A1305F2	Trichlorofluoromethane	2.1	2	12/1/94
	SSint	036A3304F2	m+p-Xylenes	1.7	2	12/3/94

NOTES:

- No phase I data were collected at this sample location
- Refer to Section 3.2.3 for detailed sample location descriptions.

Phase II

GL samples were also collected in the laundry room; these samples were collected from the location where pipes penetrate the floor. The following chemicals were detected in samples 036A1204F2, 036A2204F2, and 036A3203F2: 1,4-dichlorobenzene, chloromethane, dichlorodifluoromethane, toluene, and trichlorofluoromethane. Methylene chloride and chloroform were detected in the second and third samples, and 1,1,1-trichloroethane was detected in the first sample. Meta- and para-xylene were detected in the third sample.

4.2.3 Distribution of Chemicals in Sub-slab Samples

Phase I

No Phase I data are available for Building 36.

Phase II

The interior sub-slab location (designated SS_{int}) sampled within Building 36 was the area beneath the slab where pipes penetrate the floor, which corresponds to the GL sample location. Nine chemicals were detected at this location. 1,4-dichlorobenzene, dichlorodifluoromethane, and trichlorofluoromethane were detected in each sample (samples 036A1305F2, 036A2305F2, and 036A3304F2). Chloroform, chloromethane, methylene chloride, and toluene were detected in the second and third samples. 1,1,1-Trichloroethane was detected in the first sample, and meta- and para- xylenes were detected in the third.

The crawl space beneath the building was sampled and was designated SS_{ext}. 1,4-Dichlorobenzene, dichlorodifluoromethane, and trichlorofluoromethane were detected in each of the following samples: 036A1306F2, 036A2306F2, and 036A3305F2. Chloromethane was detected in the first and third sample, and benzene and toluene were detected in the first. Chloroform and methylene chloride were detected in both the second and third samples.

4.2.4 Distribution of Carbon Dioxide

No Phase I data are available for Building 36. Carbon dioxide measurements were not made as part of the Phase I investigation.

4.2.5 Building 36 Summary

Analysis of Building 36 air data indicates potential external sources for most chemicals detected. Styrene was not detected in SS samples, and this chemical would be evident in SS samples if an external source were present. The sample date and list of chemicals detected correlate well in terms of data collected from the BZ versus GL sample areas. However, some chemicals were either detected in only the BZ or the GL locations. Benzene and styrene were detected in BZ but not in the GL samples, and chloroform was detected at the GL location but not in the BZ.

As previously stated, the data indicates a potential exterior source for eight of the nine compounds detected (excluding styrene). This list of chemicals includes: 1,1,1-trichloroethane, 1,4-dichlorobenzene, benzene, chloromethane, dichlorodifluoromethane, methylene chloride, toluene, trichlorofluoromethane, meta- and para- xylenes, and chloroform. It should be noted that the maximum concentrations of 1,4-dichlorobenzene, dichlorodifluoromethane and trichlorofluoromethane were reported in BZ samples. Concentrations were progressively lower in GL samples and subslab samples. 1,1,1,-Trichloroethane, benzene, methylene chloride, xylenes and chloroform were the only compounds detected in subslab samples at concentrations above their corresponding interior levels. Although a potential exterior source for the other compounds may exist, it is plausible that contaminant migration from the building interior accounts for void space levels. Based on available information, it cannot be determined which scenario represents actual conditions.

4.3 Building NS84

As indicated in Table 12, the following chemicals were detected at least once in Building NS84 in BZ, GL, and SS_{ext} samples collected during the Phase I and Phase II IAQ surveys:

Table 12
Indoor Air Quality Assessment
Chemicals Detected In and Around Building N84
Charleston Naval Complex
Charleston, South Carolina

SAMPLE LOCATION	SAMPLE TYPE	ENSAFE ID	PARAMETER	(ug/m3)	SAMPLING PHASE	DATE
	BZ	N84A1101F2	1,1,1-Trichloroethane	2.5	2	11/18/94
in hallway near women's room	BZ	N84A2202F2	1,1,1-Trichloroethane	1.6	2	11/29/94
	BZ	N84A3102F2	1,1,1-Trichloroethane	2.5	2	11/30/94
	BZ	N84A2202F2	Chloromethane	0.6	2	11/29/94
	BZ	N84A3102F2	Chloromethane	0.7	2	11/30/94
	BZ	N84A2202F2	Dichlorodifluoromethane	1.3	2	11/29/94
	BZ	N84A3102F2	Dichlorodifluoromethane	1.8	2	11/30/94
	BZ	N84A1101F2	Dichlorodifluoromethane	1.3	2	11/18/94
	BZ	N84A2202F2	Styrene	3.7	2	11/29/94
	BZ	N84A1101F2	Toluene	1.7	2	11/18/94
	BZ	N84A2202F2	Toluene	1.5	2	11/29/94
	BZ	N84A3102F2	Toluene	1.8	2	11/30/94
	BZ	N84A3102F2	Trichlorofluoromethane	2.9	2	11/30/94
	BZ	N84A2202F2	Trichlorofluoromethane	2.9	2	11/29/94
	BZ	N84A1101F2	Trichlorofluoromethane	2.9	2	11/18/94
	BZ	N84A1101F2	m+p-Xylenes	2.1	2	11/18/94
	BZ	N84A2202F2	m+p-Xylenes	0.9	2	11/29/94
	GL	N84A1202F2	1,2-Dichlorotetrafluoroethane	1.5	2	11/18/94
	GL	N84A3203F2	Chloromethane	0.6	2	11/30/94
	GL	N84A2204F2	Dichlorodifluoromethane	1.3	2	11/29/94
	GL	N84A1202F2	Dichlorodifluoromethane	1.3	2	11/18/94
	GL	N84A3203F2	Dichlorodifluoromethane	1.9	2	11/30/94
	GL	N84A1202F2	Toluene	1.2	2	11/18/94

Table 12
Indoor Air Quality Assessment
Chemicals Detected In and Around Building N84
Charleston Naval Complex
Charleston, South Carolina

SAMPLE LOCATION	SAMPLE TYPE	ENSAFE ID	PARAMETER	(ug/m3)	SAMPLING PHASE	DATE
	GL	N84A3203F2	Toluene	1.0	2	11/30/94
	GL	N84A3203F2	Trichlorofluoromethane	1.7	2	11/30/94
	GL	N84A1202F2	m+p-Xylenes	2.6	2	11/18/94
	GL	N84A3203F2	m+p-Xylenes	1.8	2	11/30/94
	BZ	NS840218-01	Methylene Chloride	13.0	1	2/18/94 - 2/19/94
	BZ	NS840217-02	Methylene Chloride	44.0	1	2/17/94 - 2/18/94
	GL	NS840218-02	Methylene Chloride	6.0	1	2/18/94 - 2/19/94
	SSext	N84A2305F2	Chloromethane	0.8	2	11/29/94
Sub-slab; S side of Bldg. N84 near transformer pad	SSext	N84A3304F2	Dichlorodifluoromethane	1.7	2	11/30/94
	SSext	N84A2305F2	Dichlorodifluoromethane	1.8	2	11/29/94
	SSext	N84A2305F2	Toluene	1.0	2	11/29/94
	SSext	N84A2305F2	Trichlorofluoromethane	1.7	2	11/29/94
	SSext	N84A3304F2	Trichlorofluoromethane	1.5	2	11/30/94

NOTE:

- Refer to Section 3.2.3 for detailed sample location descriptions.

1,1,1-trichloroethane, 1,2-dichlorotetrafluoroethane, chloromethane, dichlorodifluoromethane, methylene chloride, styrene, toluene, trichlorofluoromethane, and meta-and para-xylenes.

Table 12 provides corresponding sample locations, sample type, identification number, phase, and sample date for each hit reported during the IAQ surveys in Building NS84.

4.3.1 Distribution of Chemicals in the Breathing Zone

Phase I

Methylene chloride was the only chemical detected in the BZ of Building NS84 during Phase I sampling. Methylene chloride was detected in samples NS840217-02 and NS840218-01, which correspond to a location in the hallway near the men's restroom.

Phase II

During Phase II of the IAQ survey, 1,1,1-trichloroethane, chloromethane, dichlorodifluoromethane, styrene, toluene, trichlorofluoromethane, and meta-and para-xylenes were detected in BZ samples collected at the same approximate location as the Phase I BZ samples (the hallway near the women's restroom). Of the seven chemicals, 1,1,1-trichloroethane, dichlorodifluoromethane, toluene, and trichlorofluoromethane were detected in all three BZ samples (N84A1101F2, N84A2202F2, and N84A3102F2) during the three-day monitoring period (11/18/94, 11/29/94, and 11/30/94). Based on a comparison of detected concentrations for 1,1,1-trichloroethane and trichlorofluoromethane collected at different times during the monitoring period, the concentrations were consistent over time.

Both chloromethane and meta- and para-xylenes were detected in two of the three BZ samples collected in Building NS84. Chloromethane was detected in samples collected on 11/29/94 and 11/30/94. Meta- and para-xylenes were detected on the first and last day of monitoring. Styrene was detected in sample N84A2202F2 on the second monitoring day (11/29/94).

4.3.2 Distribution of Chemicals at Ground Level

Phase I

Methylene chloride was the only chemical detected at GL within Building NS84. Methylene chloride was detected in sample NS840218-02 which was located in the hallway by file cabinets near the women's restroom.

Phase II

1,2-Dichlorotetrafluoroethane, chloromethane, dichlorodifluoromethane, toluene, trichlorofluoromethane, and meta-and para-xylenes were detected in GL samples collected during Phase II of the IAQ survey. Of the six chemicals, the most consistently detected chemical, dichlorodifluoromethane, was detected in all three GL samples (N84A1202F2, N84A2202F2, and N84A3203F2) collected over the same three-day monitoring period as the BZ samples.

Both toluene and meta-and para-xylenes were detected in two of the three GL samples (N84A1202F2 and N84A3203F2) which were collected on the first and last day of monitoring (11/18/94 and 11/30/94).

Both chloromethane and trichlorofluoromethane were detected in only one GL sample (N84A3203F2) which was collected on the third day of monitoring (11/30/94).

1,2-Dichlorotetrafluoroethane was detected in GL sample N84A1202F2. The sample was collected on the first day of monitoring, but not detected in the two samples collected approximately 11 days later.

4.3.3 Distribution of Chemicals in Sub-slab Samples

Phase I

No attempt was made to monitor sub-slab void spaces during Phase I.

Phase II

The chemicals detected within the sub-slab of Building NS84 were chloromethane, dichlorodifluoromethane, toluene, and trichlorofluoromethane. The three SS_{ext} samples collected at Building NS84 were in the sub-slab on the south side of the building near the transformer pad.

The most consistently detected chemicals during the monitoring period were dichlorodifluoromethane and trichlorofluoromethane which were detected in two of the three samples (N84A2305F2 and N84A3304F2) on subsequent days (11/29/94 and 11/30/94).

Both chloromethane and toluene were detected in sample N84A2305F2 which was collected on 11/29/94.

4.3.4 Distribution of Carbon Dioxide

In Building NS84, the range of carbon dioxide concentrations detected was from 450 to 800 ppm, which falls below the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) recommendation that carbon dioxide concentrations be maintained at less than 1,000 ppm. In a typical office building, carbon dioxide concentrations below 800 ppm are considered low and indicative of a well-ventilated space.

4.3.5 Building NS84 Summary

Methylene chloride was the only chemical detected in BZ and GL samples collected during Phase I of the IAQ survey but its presence was not confirmed by any Phase II sample results for Building NS84. Of all the chemicals detected within Building N84, four are potentially present due to exterior sources (chloromethane, dichlorodifluoromethane, trichlorofluoromethane and toluene). Each chemical was detected in BZ and GL samples collected in the hallway just past the women's restroom and in SS_{ext} samples collected in the sub-slab on the southern side of Building NS84 near the transformer pad. Chloromethane was, however, the only compound whose subslab concentrations exceeded those found in interior samples. It can, therefore, be concluded that building operations related activities are likely the source of dichlorodifluoromethane, trichlorofluoromethane and toluene detected in interior samples. The range of carbon dioxide concentrations for Building NS84 (450 to 800 ppm) indicates a well-ventilated space.

4.4 Building 202

As indicated in Table 13, the following chemicals were detected at least once in BZ, GL, and/ or SS_{ext} samples collected in Building 202 during either Phase I and/or Phase II of the IAQ surveys: 1,2-dichloroethane, dichlorodifluoromethane, Freon, tetrachloroethene, trichlorofluoromethane, trichlorotrifluoroethane (Freon 113), methylene chloride, toluene, and dichlorobenzene. Table 13 provides the sample location, sample type, EnSafe identification number, detected concentration, sampling phase, and sample collection date for the chemicals detected in Building 202.

4.4.1 Distribution of Chemicals in the Breathing Zone

Phase I

The chemicals detected in the BZ of Building 202, during Phase I of the IAQ survey were methylene chloride, dichlorobenzene, and Freon. The sample location for the BZ samples during Phase I was the expansion joint in the hallway of the ASW wing in Building 202.

Both Freon and methylene chloride were detected in two of the three samples collected in the BZ (samples 2020214-02 and 2020216-02). Sample 2020214-02 was collected during 2/14/94 - 2/15/94 and sample 2020216-02 was collected during 2/16/94 - 2/17/94. Dichlorobenzene was detected in one BZ sample 2020214-02 during 2/16/94 - 2/17/94.

Table 13
Indoor Air Quality Assessment
Chemicals Detected In and Around Building 202
Charleston Naval Complex
Charleston, South Carolina

SAMPLE LOCATION	SAMPLE TYPE	ENSAFE ID	PARAMETER	(ug/m3)	SAMPLING PHASE	DATE
	GL	2020214-01	Dichlorobenzene	17.0	1	2/14/94 - 2/15/94
Expansion joint, across from Room 117	GL	2020216-04	Freon	19.0	1	2/16/94 - 2/17/94
	GL	2020214-01	Freon	14.0	1	2/14/94 - 2/15/94
	GL	2020215-04	Methylene Chloride	57.0	1	2/15/94 - 2/16/94
	GL	2020214-01	Methylene Chloride	112.0	1	2/14/94 - 2/15/94
	GL	2020215-04	Methylene Chloride	7.0	1	2/15/94 - 2/16/94
	GL	2020216-04	Methylene Chloride	17.0	1	2/16/94 - 2/17/94
	GL	2020214-01	Toluene	9.0	1	2/14/94 - 2/15/94
	GL	202A2203F2	Tetrachloroethene	1.4	2	11/09/94
	BZ	202A3101F2	1,2-Dichloroethane	1.2	2	11/10/94
Room 117	BZ	202A1101F2	Dichlorodifluoromethane	9.5	2	11/08/94
	BZ	202A2101F2	Dichlorodifluoromethane	7.9	2	11/09/94
	BZ	202A3101F2	Dichlorodifluoromethane	16.6	2	11/10/94
	BZ	202A2101F2	Tetrachloroethene	1.5	2	11/09/94
	BZ	202A3101F2	Trichlorofluoromethane	57.3	2	11/10/94
	BZ	202A1101F2	Trichlorofluoromethane	33.6	2	11/08/94
	BZ	202A3101F2	Trichlorotrifluoroethane (Freon 113)	3.2	2	11/10/94
	BZ	202A2101F2	Trichlorotrifluoroethane (Freon 113)	2.4	2	11/09/94
	BZ	202A1101F2	Trichlorotrifluoroethane (Freon 113)	6.3	2	11/08/94
	GL	2020216-03	Freon	54.0	1	2/16/94 - 2/17/94
	GL	2020215-03	Freon	74.0	1	2/15/94 - 2/16/94
	GL	2020214-03	Freon	67.0	1	2/14/94 - 2/15/94

Table 13
Indoor Air Quality Assessment
Chemicals Detected In and Around Building 202
Charleston Naval Complex
Charleston, South Carolina

SAMPLE LOCATION	SAMPLE TYPE	ENSAFE ID	PARAMETER	(ug/m3)	SAMPLING PHASE	DATE
	GL	2020215-03	Methylene Chloride	10.0	1	2/15/94 - 2/16/94
	GL	2020216-03	Methylene Chloride	24.0	1	2/16/94 - 2/17/94
	GL	2020214-03	Methylene Chloride	15.0	1	2/14/94 - 2/15/94
	GL	202A3202F2	Trichlorotrifluoroethane (Freon 113)	2.7	2	11/10/94
	BZ	2020214-02	Dichlorobenzene	11.0	1	2/14/94 - 2/15/94
Expansion joint, hallway ASW wing	BZ	2020216-02	Freon	9.0	1	2/16/94 - 2/17/94
	BZ	2020214-02	Freon	6.0	1	2/14/94 - 2/15/94
	BZ	2020214-02	Methylene Chloride	10.0	1	2/14/94 - 2/15/94
	BZ	2020216-02	Methylene Chloride	14.0	1	2/16/94 - 2/17/94
Sub-slab at GL locations	SSext	202A1303F2	Tetrachloroethene	5.7	2	11/08/94
	SSext	202A3303F2	Trichlorotrifluoroethane (Freon 113)	2.1	2	11/10/94

NOTE:

- Refer to Section 3.2.3 for detailed sample location descriptions.

Phase II

Chemicals identified in the BZ of Building 202 during Phase II sampling include trichlorofluoromethane, 1,2-dichloroethane, dichlorodifluoromethane, tetrachloroethene, and Freon 113. The sample location for the collection BZ samples during Phase II were not the same as Phase I. Phase II BZ samples were collected in Room 117 of Building 202.

Dichlorodifluoromethane and Freon 113 were the most consistently detected chemicals in the BZ during Phase II of the IAQ survey. Both chemicals were detected in BZ samples 202A1101F2, 202A2101F2, and 202A3101F2 which were collected over three successive days (11/08/94, 11/09/94, and 11/10/94). Trichlorofluoromethane was detected in two of the three BZ samples, 202A1101F2 and 202A3101F2. The detections of trichlorofluoromethane occurred in samples collected on the first and last day of the monitoring period, 11/08/94 and 11/10/94. These chlorofluorocarbon detections in Phase II samples serve to confirm the identification of Freon during Phase I.

Both 1,2-dichloroethane and tetrachloroethene were detected in only one of the three BZ samples collected in Room 117. 1,2-Dichloroethane was detected in sample 202A3101F2 which was collected on 11/10/94. Tetrachloroethene was detected in sample 202A2101F2 which was collected on 11/9/94.

4.4.2 Distribution of Chemicals at Ground Level

Phase I

The two sample locations used in the collection of Phase I GL samples were the expansion joint across from Room 117 and Room 117. The chemicals identified in GL samples collected at the expansion joint across from Room 117 of Building 202 were dichlorobenzene, methylene chloride, toluene and Freon. Methylene chloride was the most consistently detected chemical at GL during Phase I. Methylene chloride was detected in all three BZ samples, 2020214-01, 2020215-04, and 2020216-04. The sample collection dates were 2/14/94 - 2/15/94, 2/15/94 - 2/16/94, and 2/16/94 - 2/17/94.

Freon was detected in two of the three samples, 2020214-01 collected during 2/14/94 - 2/15/94, and 2020216-04 collected during 2/16/94 - 2/17/94. Freon was not detected during the second of three sample collection periods.

Dichlorobenzene and toluene were detected in sample 2020214-01 which was one of the three GL samples collected in the area of the expansion joint across from Room 117 during 2/14/94 - 2/15/94.

The second Phase I IAQ survey location was Room 117 of Building 202. The sample collection dates for the samples collected from Room 117 are the same as those for the expansion joint across from 117. Both Freon and methylene chloride were detected in the three GL samples collected in the room (samples 2020214-03, 2020215-03, and 2020216-03).

Phase II

As was the case with the Phase I samples, the Phase II samples were collected at the expansion joint across from Room 117 and in Room 117 of Building 202. The only chemical detected within Building 202 at the expansion joint was tetrachloroethene in Sample 202A2203F2 which was collected on 11/9/94 only.

Trichlorotrifluoroethane (Freon 113) was the only chemical detected in Room 117 of Building 202. It was detected in sample 202A3202F2 collected on 11/10/94 only. These chlorofluorocarbon detections in Phase II samples serve to confirm the identification of Freon during Phase I.

The presence of dichlorobenzene, methylene chloride, and toluene (found in Phase I samples) was not confirmed by Phase II data for Building 202.

4.4.3 Distribution of Chemicals in Sub-slab Samples

Phase I

No attempt was made to monitor sub-slab void spaces during Phase I.

Phase II

Freon 113 and tetrachloroethene were the only chemicals identified within the sub-slab of Building 202. Tetrachloroethene was detected in SS_{ext} sample 202A1303F2 and Freon in sample 202A3303F2. Sample 202A1303F2 was collected on 11/8/94 and sample 202A3303F2 was collected on 11/10/94.

4.4.4 Distribution of Carbon Dioxide

In Building 202, the carbon dioxide concentrations ranged from 400 to 1,600 ppm which exceeds the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) recommendation that carbon dioxide concentrations be maintained at less than 1,000 ppm. In a typical office building, carbon dioxide concentrations above 800 ppm are considered high and indicative of an inadequately ventilated space. The recorded carbon dioxide concentrations in Room 117 suggest that the ventilation system does not provide sufficient fresh air exchange. Under poor ventilation conditions, any contaminants emanating from exterior sources would be subject to limited dilution. An effect of poor ventilation could be the concentration of contaminants having an internal and/or external source. An internal source could elicit elevated void space concentrations.

4.4.5 Building 202 Summary

Of all the chemicals detected within Building 202, two are potentially present due to exterior sources (Freon 113 and tetrachloroethene). Both of these chemicals were detected in both

Phase I and Phase II BZ and GL samples as well as the Phase II SS_{ext} sub-slab samples. It should be noted that the maximum concentrations of Freon 113 were reported in BZ samples. Concentrations were progressively lower in GL samples and sub-slab samples. This indicates that although a potential exterior source may exist, it is plausible that contaminant migration from the building interior accounts for void space levels. Based on available information, it cannot be definitively determined which scenario represents actual conditions.

4.5 Building 643

As shown in Table 14, the following chemicals were detected at least once in BZ, GL, SS_{int}, or SS_{ext} samples collected during Phase I and II IAQ surveys: 1,1,1-trichloroethane, 1,2,4-trichlorobenzene, 1,2,4-trimethylbenzene, benzyl chloride, chloromethane, dichlorodifluoromethane, styrene, toluene, trichlorofluoromethane, meta and para-xylenes, para-1 ethyltoluene, freon (Phase I group), methylene chloride, 1,3-dichlorobenzene, and hexachlorobutadiene. The distribution of these compounds observed during each phase is discussed in the following sections on a sample type specific basis. Table 14 lists the sample location, type, identification number, phase, and date for each hit reported during the IAQ surveys.

4.5.1 Distribution of Chemicals in the Breathing Zone

Phase I

Methylene chloride and Freon were the only chemicals detected in BZ samples during Phase I. Methylene chloride was detected on three successive days at the sampling location in Room 19 (samples 6430210-02, 6430211-01, and 6430212-01).. Freon was also detected in each of these samples. Both compounds were also detected in one sample (6430210-03) collected from 2/10/94 through 2/11/94 in the Mines Bay Room.

Table 14
Indoor Air Quality Assessment
Chemicals Detected In and Around Building 643
Charleston Naval Complex
Charleston, South Carolina

SAMPLE LOCATION	SAMPLE TYPE	ENSAFE ID	PARAMETER	(ug/m3)	SAMPLING PHASE	DATE
	BZ	643A1102F2	1,1,1-Trichloroethane	11.1	2	11/14/94
Room 19	BZ	643A3103F2	1,1,1-Trichloroethane	8.2	2	11/16/94
	BZ	643A2103F2	1,1,1-Trichloroethane	16.6	2	11/15/94
	BZ	643A1102F2	1,2,4-Trichlorobenzene	2.6	2	11/14/94
	BZ	643A3103F2	Benzene, 1,2,4-trimethyl	1.0	2	11/16/94
	BZ	643A2103F2	Benzene, 1,2,4-trimethyl	1.4	2	11/15/94
	BZ	643A1102F2	Benzene, 1,2,4-trimethyl	1.8	2	11/14/94
	BZ	643A1102F2	Benzyl chloride	2.8	2	11/14/94
	BZ	643A1102F2	Chloromethane	0.8	2	11/14/94
	BZ	643A3103F2	Chloromethane	1.1	2	11/16/94
	BZ	643A2103F2	Chloromethane	0.8	2	11/15/94
	BZ	643A1102F2	Dichlorodifluoromethane	23.6	2	11/14/94
	BZ	643A2103F2	Dichlorodifluoromethane	23.5	2	11/15/94
	BZ	643A3103F2	Dichlorodifluoromethane	13.8	2	11/16/94
	BZ	643A2103F2	Styrene	22.0	2	11/15/94
	BZ	643A3103F2	Toluene	1.5	2	11/16/94
	BZ	643A2103F2	Toluene	1.8	2	11/15/94
	BZ	643A1102F2	Toluene	1.6	2	11/14/94
	BZ	643A1102F2	Trichlorofluoromethane	46.6	2	11/14/94
	BZ	643A2103F2	Trichlorofluoromethane	84.8	2	11/15/94
	BZ	643A3103F2	Trichlorofluoromethane	22.7	2	11/16/94

Table 14
Indoor Air Quality Assessment
Chemicals Detected In and Around Building 643
Charleston Naval Complex
Charleston, South Carolina

SAMPLE LOCATION	SAMPLE TYPE	ENSAFE ID	PARAMETER	(ug/m3)	SAMPLING PHASE	DATE
	BZ	643A1102F2	m+p-Xylenes	1.1	2	11/14/94
	BZ	643A2103F2	p-Ethyltoluene	1.3	2	11/15/94
	BZ	643A1102F2	p-Ethyltoluene	1.3	2	11/14/94
	GL	6430210-01	Freon	6.0	1	2/10/94 - 2/11/94
	GL	6430212-02	Methylene Chloride	33.0	1	2/12/94 - 2/13/94
	GL	6430210-01	Methylene Chloride	763.0	1	2/10/94 - 2/11/94
	GL	6430211-01	Methylene Chloride	27.0	1	2/11/94 - 2/12/94
	BZ	6430212-01	Freon	6.0	1	2/12/94 - 2/13/94
	BZ	6430211-01	Freon	7.0	1	2/11/94 - 2/12/94
	BZ	6430210-02	Freon	7.0	1	2/10/94 - 2/11/94
	BZ	6430210-02	Methylene Chloride	151.0	1	2/10/94 - 2/11/94
	BZ	6430211-01	Methylene Chloride	18.0	1	2/11/94 - 2/12/94
	BZ	6430212-01	Methylene Chloride	14.0	1	2/12/94 - 2/13/94
	GL	643A3204F2	1,1,1-Trichloroethane	10.3	2	11/16/94
	GL	643A1203F2	1,1,1-Trichloroethane	11.8	2	11/14/94
	GL	643A2204F2	1,1,1-Trichloroethane	16.1	2	11/15/94
	GL	643A2204F2	Benzene, 1,2,4-trimethyl	1.0	2	11/15/94
	GL	643A1203F2	Benzene, 1,2,4-trimethyl	1.5	2	11/14/94
	GL	643A3204F2	Chloromethane	0.9	2	11/16/94
	GL	643A2204F2	Chloromethane	0.7	2	11/15/94
	GL	643A1203F2	Chloromethane	0.8	2	11/14/94
	GL	643A3204F2	Dichlorodifluoromethane	12.3	2	11/16/94

Table 14
Indoor Air Quality Assessment
Chemicals Detected In and Around Building 643
Charleston Naval Complex
Charleston, South Carolina

SAMPLE LOCATION	SAMPLE TYPE	ENSAFE ID	PARAMETER	(ug/m3)	SAMPLING PHASE	DATE
	GL	643A1203F2	Dichlorodifluoromethane	24.2	2	11/14/94
	GL	643A2204F2	Dichlorodifluoromethane	19.8	2	11/15/94
	GL	643A1203F2	Toluene	1.7	2	11/14/94
	GL	643A2204F2	Toluene	2.0	2	11/15/94
	GL	643A3204F2	Toluene	1.5	2	11/16/94
	GL	643A3204F2	Trichlorofluoromethane	21.2	2	11/16/94
	GL	643A1203F2	Trichlorofluoromethane	48.8	2	11/14/94
	GL	643A2204F2	Trichlorofluoromethane	74.2	2	11/15/94
	GL	643A1203F2	m+p-Xylenes	1.0	2	11/14/94
	GL	643A1203F2	p-Ethyltoluene	1.2	2	11/14/94
	GL	643A2204F2	p-Ethyltoluene	1.0	2	11/15/94
	SSint	643A1304F2	1,1,1-Trichloroethane	12.2	2	11/14/94
Sub-slab	SSint	643A2305F2	1,1,1-Trichloroethane	16.1	2	11/15/94
	SSint	643A3305F2	1,1,1-Trichloroethane	10.3	2	11/16/94
	SSint	643A1304F2	Benzene, 1,2,4-trimethyl	1.7	2	11/14/94
	SSint	643A2305F2	Benzene, 1,2,4-trimethyl	1.2	2	11/15/94
	SSint	643A3305F2	Benzene, 1,2,4-trimethyl	1.0	2	11/16/94
	SSint	643A3305F2	Chloromethane	0.9	2	11/16/94
	SSint	643A2305F2	Chloromethane	0.7	2	11/15/94
	SSint	643A1304F2	Chloromethane	0.9	2	11/14/94
	SSint	643A1304F2	Dichlorodifluoromethane	27.9	2	11/14/94
	SSint	643A3305F2	Dichlorodifluoromethane	12.1	2	11/16/94

Table 14
Indoor Air Quality Assessment
Chemicals Detected In and Around Building 643
Charleston Naval Complex
Charleston, South Carolina

SAMPLE LOCATION	SAMPLE TYPE	ENSAFE ID	PARAMETER	(ug/m3)	SAMPLING PHASE	DATE
	SSint	643A2305F2	Dichlorodifluoromethane	21.2	2	11/15/94
	SSint	643A3305F2	Toluene	1.6	2	11/16/94
	SSint	643A2305F2	Toluene	1.7	2	11/15/94
	SSint	643A1304F2	Toluene	2.0	2	11/14/94
	SSint	643A3305F2	Trichlorofluoromethane	20.1	2	11/16/94
	SSint	643A1304F2	Trichlorofluoromethane	59.0	2	11/14/94
	SSint	643A2305F2	Trichlorofluoromethane	78.7	2	11/15/94
	SSint	643A1304F2	m+p-Xylenes	1.1	2	11/14/94
	SSint	643A1304F2	p-Ethyltoluene	1.2	2	11/14/94
	SSint	643A2305F2	p-Ethyltoluene	1.1	2	11/15/94
	BZ	6430210-03	Freon	9.0	1	2/10/94 - 2/11/94
Middle of Mines Bay Room	BZ	6430210-03	Methylene Chloride	92.0	1	2/10/94 - 2/11/94
	SSext	643A1305F2	1,3-Dichlorobenzene	1.3	2	11/14/94
Sub-slab near SW corner	SSext	643A1305F2	Benzene, 1,2,4-trimethyl	1.4	2	11/14/94
	SSext	643A3302F2	Chloromethane	0.6	2	11/16/94
	SSext	643A1305F2	Chloromethane	0.47	2	11/14/94
	SSext	643A2302F2	Dichlorodifluoromethane	1.1	2	11/15/94
	SSext	643A1305F2	Dichlorodifluoromethane	2.2	2	11/14/94
	SSext	643A3302F2	Dichlorodifluoromethane	1.7	2	11/16/94
	SSext	643A1305F2	Hexachlorobutadiene	4.6	2	11/14/94
	SSext	643A1305F2	Toluene	1.0	2	11/14/94
	SSext	643A3302F2	Toluene	4.3	2	11/16/94

Table 14
Indoor Air Quality Assessment
Chemicals Detected In and Around Building 643
Charleston Naval Complex
Charleston, South Carolina

SAMPLE LOCATION	SAMPLE TYPE	ENSAFE ID	PARAMETER	(ug/m3)	SAMPLING PHASE	DATE
	SSext	643A1305F2	Trichlorofluoromethane	7.0	2	11/14/94
	SSext	643A3302F2	Trichlorofluoromethane	5.9	2	11/16/94
	SSext	643A2302F2	Trichlorofluoromethane	6.7	2	11/15/94
	SSext	643A1305F2	m+p-Xylenes	1.8	2	11/14/94

NOTE:

- Refer to Section 3.2.3 for detailed sample location descriptions.

Phase II

1,1,1-Trichloroethane, 1,2,4-trimethylbenzene, chloromethane, dichlorodifluoromethane, toluene, and trichlorofluoromethane were detected in each BZ sample collected in Room 19 during Phase II (samples 643A1102F2, 6432103F2, and 643A3103F2). The samples were collected on three successive days starting on 11/14/94. Table 14 shows the range of detected concentrations. 1,2,4-Trichlorobenzene, benzyl chloride, styrene, and para-ethyltoluene were also detected in Room 19. 1,2,4-Trichlorobenzene was detected in sample 643A1102F2. Benzyl chloride was detected in sample 643A1102F2. Styrene was detected in sample 643A2103F2. para-Ethyltoluene was detected in two samples (643A2103F2 and 6431102F2). Methylene chloride was not detected in any Phase II BZ sample in Building 643. The chlorofluorocarbon detections confirm the presence of Freon.

4.5.2 Distribution of Chemicals at Ground Level

Phase I

Methylene chloride and Freon were detected in GL samples collected during the Phase I IAQ survey in Room 19. Methylene chloride was detected in three successive daily samples (samples 6430212-02, 6430210-01 and 6430211-01) between 2/10/94 and 2/13/94. Freon was also detected in sample 6430210-01 (2/10-11/94).

Phase II

1,1,1-Trichloroethane, chloromethane, dichlorodifluoromethane, toluene and trichloro-fluoromethane were detected in all three Phase II IAQ survey GL samples in Room 19. Phase II sampling was conducted in this area between 11/14/94 and 11/16/94. 1,2,4-Trimethylbenzene was detected in two samples (643A2204F2 and 643A1203F2) collected on successive days (11/14/94 and 11/15/94). Meta- and para-Xylenes were detected in sample 643A1203F2 only. Para-Ethyltoluene was detected in two samples (6432204AF2 and 6431203F2) collected on successive days (11/14/94 and 11/15/94). The presence of methylene chloride in Room 19 was not confirmed through Phase II sampling. The chlorofluorocarbon detections confirm the presence of Freon.

4.5.3 Distribution of Chemicals in Sub-slab Samples

Phase I

No sub-slab sampling was performed as part of the Phase I IAQ survey.

Phase II

Both interior and exterior sub-slab samples were collected during Phase II IAQ sampling. 1,1,1-Trichloroethane, 1,2,4-trimethylbenzene, chloromethane, dichlorodifluoromethane, toluene and trichlorofluoromethane were detected in each of three successive daily SS_{int} samples starting on 11/14/94 (samples 643A1304F2, 643A2305F2, and 643A3305F2). These samples were collected near the Room 19 GL sampling location through a floor crack. Meta- and para-Xylenes were detected in the initial SS_{int} sample but were not found in subsequent samples from this location. Para-Ethyltoluene was detected in the first two sub-slab samples from this location.

Three exterior sub-slab SS_{ext} samples were also collected over the same sampling period at the southwest corner of Building 643. Dichlorodifluoromethane and trichlorofluoromethane were detected in each of three successive daily SS_{ext} samples starting on 11/14/95 (samples 643A1305F2, 643A2302F2, and 643A3302F2). Chloromethane and toluene were each detected in the first and last daily SS_{ext} samples at this location. 1,3-Dichlorobenzene, 1,2,4-trimethylbenzene, hexachlorobutadiene, and meta- and para-xylenes were detected in the first daily SS_{ext} sample from the southwest corner of Building 643.

4.5.4 Distribution of Carbon Dioxide

The Phase I IAQ survey included carbon dioxide monitoring in many of the buildings within the scope of the FFI. Due to equipment failure, however, no monitoring was performed in Building 643. No supplemental carbon dioxide monitoring was proposed for Phase II.

4.5.5 Building 643 Summary

Although methylene chloride was detected in BZ and GL samples collected during Phase I, Phase II IAQ survey results did not confirm its presence in either location in Room 19. Furthermore, no sub-slab sample collected in and around Building 643 during Phase II was found to contain methylene chloride. Freon (or specific constituents thereof) was detected in Room 19 in BZ and GL samples during both sampling phases. A potential source of these compounds was also indicated by sub-slab sample results (SS_{int} and SS_{ext}), although subslab concentrations were generally less than or equal to corresponding interior levels. This indicates that building operations related activities (i.e. HVAC systems) may be the source of Freon compounds.

1,1,1-Trichloroethane, 1,2,4-trimethylbenzene, chloromethane, toluene, meta- and para-xylenes, and para-ethyltoluene were found in BZ and GL samples in Room 19 during Phase II. A potential sub-slab source for each of these contaminants was identified through analysis of Phase II SS_{int} and SS_{ext} sample results. With the exception of xylenes, the maximum concentrations of each compound were reported in building interior samples (BZ or GL). This indicates that the source is likely related to building operations rather than an exterior source.

No sub-slab source for 1,2,4-trichlorobenzene, benzyl chloride or styrene hits reported in Phase II BZ samples was identified. 1,3-Dichlorobenzene and hexachlorobutadiene were detected in at least one SS_{ext} sample collected during Phase II. Neither compound was detected in BZ or GL samples in Building 643.

4.6 Building 644

As part of the IAQ survey, air samples were collected in two phases for Building 644. Both sampling phases targeted a floor crack between bowling alleys 24 and 25. As shown in Table 15, the following 18 chemicals were detected during the Phase I and Phase II IAQ investigation in BZ, GL, SS_{int} and SS_{ext} samples at Building 644: freon, methylene chloride, trimethylbenzene, 1,1,1-trichloroethane, benzene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, chloromethane, dichlorodifluoromethane, ethylbenzene, toluene, trichlorofluoromethane, meta- and para- xylenes, ortho-xylene, para-ethyltoluene, 1,2,4-trichlorobenzene, benzyl chloride, hexachlorobutadiene, and trichlorofluoromethane. Table 15 also lists the sample location, type, identification number, phase, and date for each hit reported during the IAQ surveys.

4.6.1 Distribution of Chemicals in the Breathing Zone

Phase I

Three chemicals were detected in Phase I BZ samples collected near the crack between alleys 24 and 25. Samples 6440218-02, 6440217-02, and 6440222-02 were collected on 2/17/94, 2/18/94 and 2/22/94, respectively. Freon and trimethylbenzene were detected in each sample collected and methylene chloride was detected in samples 6440218-02 and 6440217-02.

Phase II

Twelve chemicals were detected as a result of Phase II IAQ sampling. Phase II BZ sample locations were co-located with Phase I samples. Of the chemicals detected, dichlorodifluoromethane and trichlorofluoromethane (detected in BZ samples 644A1106F2, 644A2107F2, and 644A3106F2 with a sampling period of 11/14/94 through 11/16/94) corresponds with Freon detected during the Phase I investigation. However, correlation between Phase I Freon data and structurally similar compounds detected during the Phase II investigation is not possible because chlorofluorocarbons were grouped for Phase I presentation. 1,1,1-trichloroethane was detected in only one Phase II sample (644A3106F2).

Table 15
Indoor Air Quality Assessment
Chemicals Detected In and Around Building 644
Charleston Naval Complex
Charleston, South Carolina

SAMPLE LOCATION	SAMPLE TYPE	ENSAFE ID	PARAMETER	(ug/m3)	SAMPLING PHASE	DATE
	BZ	6440218-02	Freon	15.0	1	2/18/94 - 2/19/94
near crack between alleys 24 & 25	BZ	6440217-02	Freon	17.0	1	2/17/94 - 2/18/94
	BZ	6440222-02	Freon	23.0	1	2/22/94 - 2/23/94
	BZ	6440217-02	Methylene Chloride	32.0	1	2/17/94 - 2/18/94
	BZ	6440218-02	Methylene Chloride	37.0	1	2/18/94 - 2/19/94
	BZ	6440217-02	Trimethylbenzene	14.0	1	2/17/94 - 2/18/94
	BZ	6440222-02	Trimethylbenzene	20.0	1	2/22/94 - 2/23/94
	BZ	6440218-02	Trimethylbenzene	26.0	1	2/18/94 - 2/19/94
	BZ	644A3106F2	1,1,1-Trichloroethane	1.9	2	11/16/94
	BZ	644A1106F2	Benzene	4.4	2	11/14/94
	BZ	644A2107F2	Benzene, 1,2,4-trimethyl	34.6	2	11/15/94
	BZ	644A1106F2	Benzene, 1,2,4-trimethyl	28.3	2	11/14/94
	BZ	644A3106F2	Benzene, 1,2,4-trimethyl	48.9	2	11/16/94
	BZ	644A1106F2	Benzene, 1,3,5-trimethyl-	8.9	2	11/14/94
	BZ	644A3106F2	Benzene, 1,3,5-trimethyl-	14.5	2	11/16/94
	BZ	644A2107F2	Benzene, 1,3,5-trimethyl-	10.2	2	11/15/94
	BZ	644A3106F2	Chloromethane	1.5	2	11/16/94
	BZ	644A2107F2	Chloromethane	1.4	2	11/15/94
	BZ	644A1106F2	Chloromethane	2.1	2	11/14/94
	BZ	644A1106F2	Dichlorodifluoromethane	5.0	2	11/14/94
	BZ	644A2107F2	Dichlorodifluoromethane	4.9	2	11/15/94
	BZ	644A3106F2	Dichlorodifluoromethane	3.6	2	11/16/94

Table 15
Indoor Air Quality Assessment
Chemicals Detected In and Around Building 644
Charleston Naval Complex
Charleston, South Carolina

SAMPLE LOCATION	SAMPLE TYPE	ENSAFE ID	PARAMETER	(ug/m3)	SAMPLING PHASE	DATE
	BZ	644A1106F2	Ethylbenzene	1.4	2	11/14/94
	BZ	644A2107F2	Ethylbenzene	1.0	2	11/15/94
	BZ	644A3106F2	Ethylbenzene	1.0	2	11/16/94
	BZ	644A2107F2	Toluene	3.1	2	11/15/94
	BZ	644A1106F2	Toluene	6.6	2	11/14/94
	BZ	644A3106F2	Toluene	3.4	2	11/16/94
	BZ	644A3106F2	Trichlorofluoromethane	102.8	2	11/16/94
	BZ	644A1106F2	Trichlorofluoromethane	69.7	2	11/14/94
	BZ	644A2107F2	Trichlorofluoromethane	114.6	2	11/15/94
	BZ	644A2107F2	m+p-Xylenes	4.7	2	11/15/94
	BZ	644A1106F2	m+p-Xylenes	5.9	2	11/14/94
	BZ	644A3106F2	m+p-Xylenes	4.6	2	11/16/94
	BZ	644A3106F2	o-Xylene	4.1	2	11/16/94
	BZ	644A2107F2	o-Xylene	3.4	2	11/15/94
	BZ	644A1106F2	o-Xylene	4.0	2	11/14/94
	BZ	644A1106F2	p-Ethyltoluene	25.6	2	11/14/94
	BZ	644A2107F2	p-Ethyltoluene	29.4	2	11/15/94
	BZ	644A3106F2	p-Ethyltoluene	42.2	2	11/16/94
	GL	6440217-01	Methylene Chloride	14.0	1	2/17/94 - 2/18/94
	GL	6440218-01	Methylene Chloride	18.0	1	2/18/94 - 2/19/94
	GL	644A2206F2	1,2,4-Trichlorobenzene	2.5	2	11/15/94
	GL	644A1207F2	Benzene, 1,2,4-trimethyl	2.6	2	11/14/94
	GL	644A2206F2	Benzene, 1,2,4-trimethyl	2.2	2	11/15/94

Table 15
Indoor Air Quality Assessment
Chemicals Detected In and Around Building 644
Charleston Naval Complex
Charleston, South Carolina

SAMPLE LOCATION	SAMPLE TYPE	ENSAFE ID	PARAMETER	(ug/m3)	SAMPLING PHASE	DATE
	GL	644A3207F2	Benzene, 1,2,4-trimethyl	2.8	2	11/16/94
	GL	644A2206F2	Benzyl chloride	2.2	2	11/15/94
	GL	644A3207F2	Dichlorodifluoromethane	1.6	2	11/16/94
	GL	644A1207F2	Dichlorodifluoromethane	2.1	2	11/14/94
	GL	644A2206F2	Dichlorodifluoromethane	1.8	2	11/15/94
	GL	644A2206F2	Hexachlorobutadiene	4.3	2	11/15/94
	GL	644A1207F2	Toluene	0.9	2	11/14/94
	GL	644A2206F2	Trichlorofluoromethane	10.3	2	11/15/94
	GL	644A3207F2	Trichlorofluoromethane	8.9	2	11/16/94
	GL	644A1207F2	Trichlorofluoromethane	9.6	2	11/14/94
	GL	644A2206F2	p-Ethyltoluene	1.8	2	11/15/94
	GL	644A1207F2	p-Ethyltoluene	1.8	2	11/14/94
	GL	644A3207F2	p-Ethyltoluene	2.3	2	11/16/94
	SSint	644A1308F2	Benzene, 1,2,4-trimethyl	2.0	2	11/14/94
Sub-slab at crack in alley	SSint	644A3308F2	Benzene, 1,2,4-trimethyl	1.6	2	11/16/94
	SSint	644A2308F2	Benzene, 1,2,4-trimethyl	1.1	2	11/15/94
	SSint	644A1308F2	Chloromethane	0.47	2	11/14/94
	SSint	644A2308F2	Dichlorodifluoromethane	2.0	2	11/15/94
	SSint	644A3308F2	Dichlorodifluoromethane	1.5	2	11/16/94
	SSint	644A1308F2	Dichlorodifluoromethane	2.6	2	11/14/94
	SSint	644A1308F2	Toluene	0.8	2	11/14/94
	SSint	644A2308F2	Trichlorofluoromethane	9.6	2	11/15/94
	SSint	644A3308F2	Trichlorofluoromethane	8.3	2	11/16/94

Table 15
Indoor Air Quality Assessment
Chemicals Detected In and Around Building 644
Charleston Naval Complex
Charleston, South Carolina

SAMPLE LOCATION	SAMPLE TYPE	ENSAFE ID	PARAMETER	(ug/m3)	SAMPLING PHASE	DATE
	SSint	644A1308F2	Trichlorofluoromethane	13.2	2	11/14/94
	SSint	644A1308F2	p-Ethyltoluene	1.4	2	11/14/94
	SSint	644A3308F2	p-Ethyltoluene	1.2	2	11/16/94
	SSext	644A2309F2	Chloromethane	0.8	2	11/15/94
Sub-slab near SW corner of Bldg 644	SSext	644A3309F2	Chloromethane	0.7	2	11/16/94
	SSext	644A1309F2	Chloromethane	1.1	2	11/14/94
	SSext	644A2309F2	Dichlorodifluoromethane	1.6	2	11/15/94
	SSext	644A1309F2	Dichlorodifluoromethane	2.0	2	11/14/94
	SSext	644A3309F2	Dichlorodifluoromethane	1.0	2	11/16/94
	SSext	644A3410F2	Toluene	1.4	2	11/16/94
	SSext	644A1309F2	Toluene	1.3	2	11/14/94
	SSext	644A2309F2	Toluene	0.9	2	11/15/94
	SSext	644A2309F2	Trichlorofluoromethane	1.7	2	11/15/94
	SSext	644A1309F2	Trichlorofluoromethane	1.8	2	11/14/94
	SSext	644A3309F2	Trichlorofluoromethane	10.0	2	11/16/94
	SSext	644A3410F2	p-Ethyltoluene	1.0	2	11/16/94

NOTE:

- Refer to Section 3.2.3 for detailed sample location descriptions.

Other compounds were detected in the BZ during the Phase II investigation, but these detected compounds did not correspond with the Phase I BZ data. 1,2,4-Trimethylbenzene, 1,3,5-trimethylbenzene, chloromethane, ethylbenzene, toluene, meta- and para-xylenes, ortho-xylene, and para-ethyl toluene were reported in samples 644A3106F2, 644A1106F2, and 644A2107F2. Benzene was detected at one sample location, 644A1106F2. Methylene chloride was not detected in the Phase II BZ samples.

4.6.2 Distribution of Chemicals at Ground Level

Phase I

The Phase I IAQ investigation identified methylene chloride in the GL samples at two sample locations (6440217-01 and 6440218-02 which were collected 2/17/94 - 2/18/94 and 2/18/94 - 2/19/94, respectively). Sample locations correspond to Phase I and Phase II BZ samples.

Phase II

Phase II GL sampling was performed on the same days as Phase II BZ sampling. Eight compounds were detected in the GL samples, and four were detected on all sample dates. 1,2,4-Trimethylbenzene, dichlorodifluoromethane, trichlorofluoromethane, and para-ethyltoluene were detected in GL samples 644A1207F2, 644A2206F2, and 644A3207F2. 1,2,4-Trichlorobenzene, benzyl chloride, and hexachlorobutadiene were detected during the second day of sampling in one sample, 644A2107F2. Toluene was detected the first day of sampling in sample 644A1207F2. It is important to note that methylene chloride reported in Phase I samples was not confirmed by Phase II BZ or GL samples.

4.6.3 Distribution of Chemicals in Sub-slab Samples

Phase I

No sub-slab samples were collected during the Phase I investigation.

Phase II

The sample designation SS_{int} is used to designate sub-slab samples collected within the interior of this building. The samples were collected from within the crack in the alley, and sample dates for Phase II SS sample locations correspond with Phase II BZ and GL samples. The following compounds were detected at SS_{int} sample locations 644A1308F2, 644A2308F2, and 644A3308F2: 1,2,4-trimethylbenzene, dichlorodifluoromethane, and trichlorofluoromethane. In addition, chloromethane, toluene, and para-ethyltoluene were detected in sample 644A1308F2.

Samples were also collected from within the crack located near the corner of Building 644. Chloromethane, dichlorodifluoromethane, toluene, and trichlorofluoromethane were detected in samples 644A1309F2, 644A2309F2, and 644A3309F2. Para-ethyltoluene was detected in sample 644A3410F2. These exterior samples were designated SS_{ext}, and were collected on the three corresponding dates discussed above.

4.6.4 Distribution of Carbon Dioxide

Carbon dioxide concentrations in Building 644 range from 400 to 800, which indicates a well-ventilated building. This concentration does not exceed the ASHRAE recommendation that carbon dioxide concentrations be maintained at less than 1,000 ppm. In a typical office building, carbon dioxide concentrations below 800 ppm are considered low and indicative of a well ventilated space. This indicates sufficient air transfer to dilute volatile compounds that potentially infiltrate into buildings from exterior sources.

4.6.5 Building 644 Summary

Phase I and Phase II data indicate Freon and similarly structured compounds could be present due to an external source. However, the chemical group Freon was not separated by the contracted laboratory during the Phase I investigation, so direct correlation between the two investigative phases is not possible. Phase II data indicate 1,2,4-Trimethylbenzene, chloromethane, dichlorodifluoromethane, toluene, trichlorofluoromethane, and para-ethyltoluene may have external sources. The BZ and GL samples were collected at corresponding locations in Phase I and II, and the concentrations reported for the BZ samples are generally greater than those detected in GL samples. Based on a comparison of BZ, GL, and SS results, the list of chemicals detected appears to correlate qualitatively between BZ, GL, and SS sample locations. Considering the SS sample locations, this correlation could indicate the presence of an external source.

It should be noted that the maximum concentrations of 1,2,4-trimethylbenzene, toluene, trichlorofluoromethane, and para-ethyltoluene were reported in BZ samples. Concentrations were progressively lower in GL samples and sub-slab samples. Although a potential exterior source may exist for each, the concentration pattern indicate that a more plausible explanation would be that contaminants migrating from the building interior account for void space levels. Based on available information, it cannot be definitively determined which scenario represents actual conditions.

It is important to note that the presence of trimethylbenzene was confirmed by Phase II samples. Although methylene chloride was detected in Phase I samples, this compound was not detected in Phase II BZ, GL, or SS samples. In addition, hexachlorobutadiene, 1,2,4-trichlorobenzene, and benzyl chloride were detected in GL samples, but not in either BZ or SS samples. Xylenes, 1,3,5-trimethylbenzene, 1,1,1-trichlorobenzene, ethylbenzene, and benzene were detected only in BZ samples. Any chemical not detected in sub-slab samples indicates that its presence is not likely due to an external source. Chemicals for which no potential external source was identified include methylene chloride, 1,1,1-trichlorobenzene, benzene, ethylbenzene, xylenes, 1,2,4-trichlorobenzene, benzyl chloride, and hexachlorobutadiene.

4.7 Building 645

As shown in Table 16, the following chemicals were detected at least once in BZ, GL, SS_{int}, or SS_{ext} samples collected during Phase I and II IAQ surveys in Building 645: 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, chloroethane, chloroform, ethylbenzene, methylene chloride, styrene, para-ethyltoluene, and ortho-, para- and meta-xylenes. The distribution of these compounds observed during each phase is discussed in the following sections by sample location and type. Two areas within Building 645 were targeted for BZ and GL sampling during the IAQ surveys. These areas were Room 103 (classroom) and Room 104 (Diesel Lab). In addition, one SS_{int} and one SS_{ext} sampling location were monitored during Phase II. Table 16 also provides the sample location, type, identification number, phase, and date for each hit reported during the IAQ surveys.

4.7.1 Distribution of Chemicals in the Breathing Zone

Phase I

Three successive daily BZ samples were collected in Room 103 (samples 6450214-03, 6450215-03, and 6450216-03) starting on 2/14/94. Methylene chloride was the only compound detected, and was found in each sample.

Phase II

Three successive daily BZ samples (samples 645A1104F2, 645A62107F2, and 645A3105F2) were collected starting on 11/8/94. The sampling point was relocated during Phase II sampling to Room 104 (Diesel Lab). Only the 11/9/94 sample was found to contain quantifiable concentrations of any target compound. Styrene and tetrachloroethene were detected in this sample. Table 16 shows the range of detected concentrations of these compounds. Methylene chloride was not detected in any Phase II BZ sample.

Table 16
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SAMPLE LOCATION	SAMPLE TYPE	ENSAFE ID	PARAMETER	(ug/m3)	SAMPLING PHASE	DATE
Rm 104	BZ	645A2107F2	Styrene	95.0	2	11/09/94
	BZ	645A2107F2	Tetrachloroethene	1.4	2	11/09/94
	GL	6450215-01	Methylene Chloride	12.0	1	2/15/94 - 2/16/94
	GL	6450216-01	Methylene Chloride	9.0	1	2/16/94 - 2/17/94
	GL	6450214-01	Methylene Chloride	71.0	1	2/14/94 - 2/15/94
Rm 105	BZ	6450215-03	Methylene Chloride	22.0	1	2/15/94 - 2/16/94
	BZ	6450216-03	Methylene Chloride	21.0	1	2/16/94 - 2/17/94
	BZ	6450214-03	Methylene Chloride	21.0	1	2/14/94 - 2/15/94
Sub-slab near Rm 105 entrance	SSint	645A1306F2	Benzene, 1,2,4-trimethyl	21153	2	11/08/94
	SSint	645A1306F2	Benzene, 1,3,5-trimethyl-	3789	2	11/08/94
	SSint	645A3307F2	Chloroethane	1.6	2	11/10/94
	SSint	645A1306F2	Ethylbenzene	517	2	11/08/94
	SSint	645A1306F2	Styrene	1721	2	11/08/94
	SSint	645A1306F2	m+p-Xylenes	3135	2	11/08/94
	SSint	645A1306F2	o-Xylene	2471	2	11/08/94
	SSint	645A1306F2	p-Ethyltoluene	12368	2	11/08/94
Sub-slab near Bldg 645	SSext	645A2304F2	Chloroform	1.0	2	11/09/94

NOTE:

- Refer to Section 3.2.3 for detailed sample location descriptions.

4.7.2 Distribution of Chemicals at Ground Level

Phase I

Three successive daily GL samples (samples 6450214-01, 6450215-01, and 6450216-01) were collected starting on 2/14/94. The sampling point was in Room 104 next to the door leading to Room 105 (generator room). Methylene chloride, the only compound detected, was identified in each sample.

Phase II

Three Phase II GL samples (samples 645A1306F2, 645A2306F2, and 645A3307F2) were collected on successive days starting on 11/8/94. No target compounds were detected in any sample.

4.7.3 Distribution of Chemicals in Sub-slab Samples

Phase I

No sub-slab sampling was performed as part of the Phase I IAQ survey.

Phase II

Both interior and exterior sub-slab samples were collected during Phase II IAQ sampling. One SS_{int} and one SS_{ext} sample location were monitored. Three successive daily SS_{int} samples were collected (samples 645A1306F2, 645A2306F2, and 645A3307F2) starting on 11/8/94. These samples were obtained by gaining access to the sub-slab void through a crack in the floor in Room 104 (near the generator room door). 1,2,4-Trimethylbenzene, 1,3,5-trimethylbenzene, ethylbenzene, styrene, meta- para- and ortho-xylenes, and para-ethyltoluene were detected exclusively in the initial sub-slab sample. The concentrations reported for these compounds were among the highest reported at any Phase II IAQ survey sampling location. Chloroethane was detected in the last SS_{int} sample only.

Three successive daily SS_{ext} samples (samples 645A1307F2, 645A2304F2, and 645A3308F2) were also collected over the Phase II sampling period at a location beneath Room 104. No target compounds were detected in the first or last SS_{ext} sample. Chloroform was detected in the sample collected on 11/9/94.

4.7.4 Distribution of Carbon Dioxide

The Phase I IAQ survey included carbon dioxide monitoring throughout Building 645, which was characterized as an unoccupied classroom. Carbon dioxide concentrations ranged from 480 to 580 ppm, which are below the ASHRAE recommended concentration of less than 1,000 ppm. In a typical office building, carbon dioxide concentrations below 800 ppm are considered to be low and indicative of a well-ventilated space. The concentrations recorded in Building 645 indicate adequate ventilation when unoccupied. Higher occupancy that would be expected when the classroom is in use could result in carbon dioxide levels above those recorded during the Phase I IAQ survey.

4.7.5 Building 645 Summary

The methylene chloride detections reported during Phase I were not confirmed by Phase II BZ or GL results. Furthermore, no sub-slab source of methylene chloride was identified. No potential sub-slab source was identified for the single tetrachloroethene hit reported in Room 104 during Phase II sampling.

Styrene was the only compound identified inside the building and in the sub-slab void. The predominantly aromatic compound group detected in SS_{int} sample may be associated with the adjacent generator room. The source of chlorinated compounds found in sub-slab samples cannot be ascertained with available information. It may be concluded, however, that no appreciable migration of sub-slab contaminants (with the exception of styrene) to potentially occupied areas occurred over the sampling period.

4.8 Building 656

As shown in Table 17, the following chemicals were detected at least once in BZ, GL, SS_{int}, or SS_{ext} samples collected during Phase I and II IAQ surveys in Building 656: 1,1,1-trichloroethane, 1,4-dichlorobenzene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, benzene, ethylbenzene, tetrachloroethene, trichloroethene, chloromethane, dichlorodifluoromethane, styrene, toluene, trichlorofluoromethane, trichlorotrifluoroethane, meta and para-xylenes, para-ethyltoluene, and methylene chloride. The distribution of these compounds observed during each phase is discussed in the following sections by sample location and type. Three areas within Building 656 (Base Exchange Building) were targeted for BZ and GL sampling during the IAQ surveys, and each area is discussed separately in the following sections. In addition, one SS_{int} and two SS_{ext} sampling locations were monitoring during Phase II. Table 17 also provides the sample location, type, identification number, phase, and date for each hit reported during the IAQ surveys.

4.8.1 Distribution of Chemicals in the Breathing Zone

4.8.1.1 Bicycle Display Area

Phase I

Three successive daily BZ samples were collected in the store area near the bicycle display (samples 6560223-03, 6560224-03, and 6560225-03) starting on 2/23/94. Methylene chloride, and toluene were the only chemicals detected in BZ samples from this area during Phase I. Methylene chloride was detected on the last two days at the sampling location, but was absent in the initial Phase I sample. Toluene was detected in each Phase I sample.

Phase II

Three successive daily BZ samples (samples 656A1103F2, 656A2109F2, and 656A3108F2) were collected starting on 12/6/94 at this location. The following compounds were detected in BZ samples from the bicycle display area: 1,1,1-Trichloroethane, 1,4-dichlorobenzene, benzene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, chloromethane, dichlorodifluoromethane,

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SAMPLE LOCATION	SAMPLE TYPE	ENSAFE ID	PARAMETER	(ug/m3)	SAMPLING PHASE	DATE
	BZ	6560225-03	Methylene Chloride	9.0	1	2/25/94 - 2/26/94
store area near bicycle display	BZ	6560224-03	Methylene Chloride	12.0	1	2/24/94 - 2/25/94
	BZ	6560225-03	Toluene	7.0	1	2/25/94 - 2/26/94
	BZ	6560224-03	Toluene	6.0	1	2/24/94 - 2/25/94
	BZ	6560223-03	Toluene	8.0	1	2/23/94 - 2/24/94
	BZ	656A2109F2	1,1,1-Trichloroethane	2.3	2	12/07/94
	BZ	656A3108F2	1,1,1-Trichloroethane	2.0	2	12/08/94
	BZ	656A1103F2	1,1,1-Trichloroethane	2.8	2	12/06/94
	BZ	656A3108F2	1,4-Dichlorobenzene	1.4	2	12/08/94
	BZ	656A1103F2	1,4-Dichlorobenzene	3.1	2	12/06/94
	BZ	656A2109F2	1,4-Dichlorobenzene	2.3	2	12/07/94
	BZ	656A2109F2	Benzene	1.1	2	12/07/94
	BZ	656A1103F2	Benzene	1.2	2	12/06/94
	BZ	656A2109F2	Benzene, 1,2,4-trimethyl	2.1	2	12/07/94
	BZ	656A3108F2	Benzene, 1,2,4-trimethyl	2.0	2	12/08/94
	BZ	656A1103F2	Benzene, 1,2,4-trimethyl	3.2	2	12/06/94
	BZ	656A1103F2	Benzene, 1,3,5-trimethyl-	1.3	2	12/06/94
	BZ	656A2109F2	Chloromethane	0.9	2	12/07/94
	BZ	656A3108F2	Chloromethane	0.7	2	12/08/94
	BZ	656A1103F2	Chloromethane	1.1	2	12/06/94
	BZ	656A1103F2	Dichlorodifluoromethane	9.2	2	12/06/94
	BZ	656A2109F2	Dichlorodifluoromethane	9.0	2	12/07/94

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SAMPLE LOCATION	SAMPLE TYPE	ENSAFE ID	PARAMETER	(ug/m3)	SAMPLING PHASE	DATE
	BZ	656A3108F2	Dichlorodifluoromethane	7.5	2	12/08/94
	BZ	656A1103F2	Ethylbenzene	1.0	2	12/06/94
	BZ	656A2109F2	Ethylbenzene	1.4	2	12/07/94
	BZ	656A2109F2	Methylene chloride	13.5	2	12/07/94
	BZ	656A3108F2	Methylene chloride	1.1	2	12/08/94
	BZ	656A1103F2	Methylene chloride	2.4	2	12/06/94
	BZ	656A2109F2	Styrene	13.2	2	12/07/94
	BZ	656A1103F2	Styrene	16.9	2	12/06/94
	BZ	656A3108F2	Tetrachloroethene	7.1	2	12/08/94
	BZ	656A2109F2	Tetrachloroethene	7.9	2	12/07/94
	BZ	656A1103F2	Tetrachloroethene	5.6	2	12/06/94
	BZ	656A1103F2	Toluene	18.5	2	12/06/94
	BZ	656A3108F2	Toluene	6.1	2	12/08/94
	BZ	656A2109F2	Toluene	19.7	2	12/07/94
	BZ	656A2109F2	Trichloroethene	1.3	2	12/07/94
	BZ	656A2109F2	Trichlorofluoromethane	7.1	2	12/07/94
	BZ	656A3108F2	Trichlorofluoromethane	3.5	2	12/08/94
	BZ	656A1103F2	Trichlorofluoromethane	4.5	2	12/06/94
	BZ	656A2110F2	Trichlorotrifluoroethane (Freon 113)	3.8	2	12/07/94
	BZ	656A2109F2	m+p-Xylenes	5.9	2	12/07/94
	BZ	656A3108F2	m+p-Xylenes	1.0	2	12/08/94
	BZ	656A1103F2	m+p-Xylenes	4.0	2	12/06/94
	BZ	656A2109F2	p-Ethyltoluene	1.9	2	12/07/94

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SAMPLE LOCATION	SAMPLE TYPE	ENSAFE ID	PARAMETER	(ug/m3)	SAMPLING PHASE	DATE
	BZ	656A1103F2	p-Ethyltoluene	2.1	2	12/06/94
	BZ	656A3108F2	p-Ethyltoluene	2.1	2	12/08/94
	GL	656A1202F2	1,1,1-Trichloroethane	2.7	2	12/06/94
	GL	656A3209F2	1,1,1-Trichloroethane	1.9	2	12/08/94
	GL	656A2208F2	1,1,1-Trichloroethane	2.3	2	12/07/94
	GL	656A2208F2	1,4-Dichlorobenzene	2.1	2	12/07/94
	GL	656A3209F2	1,4-Dichlorobenzene	1.6	2	12/08/94
	GL	656A1202F2	1,4-Dichlorobenzene	2.8	2	12/06/94
	GL	656A1202F2	Benzene	1.1	2	12/06/94
	GL	656A2208F2	Benzene	1.0	2	12/07/94
	GL	656A3209F2	Benzene, 1,2,4-trimethyl	2.5	2	12/08/94
	GL	656A2208F2	Benzene, 1,2,4-trimethyl	1.7	2	12/07/94
	GL	656A1202F2	Benzene, 1,2,4-trimethyl	2.7	2	12/06/94
	GL	656A3209F2	Benzene, 1,3,5-trimethyl-	1.1	2	12/08/94
	GL	656A1202F2	Benzene, 1,3,5-trimethyl-	1.1	2	12/06/94
	GL	656A3209F2	Chloromethane	0.7	2	12/08/94
	GL	656A1202F2	Chloromethane	1.0	2	12/06/94
	GL	656A2208F2	Chloromethane	0.8	2	12/07/94
	GL	656A3209F2	Dichlorodifluoromethane	8.2	2	12/08/94
	GL	656A1202F2	Dichlorodifluoromethane	9.3	2	12/06/94
	GL	656A2208F2	Dichlorodifluoromethane	10.2	2	12/07/94
	GL	656A1202F2	Ethylbenzene	1.0	2	12/06/94
	GL	656A2208F2	Methylene chloride	2.7	2	12/07/94

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SAMPLE LOCATION	SAMPLE TYPE	ENSAFE ID	PARAMETER	(ug/m3)	SAMPLING PHASE	DATE
	GL	656A1202F2	Methylene chloride	2.3	2	12/06/94
	GL	656A3209F2	Methylene chloride	1.9	2	12/08/94
	GL	656A3209F2	Styrene	5.1	2	12/08/94
	GL	656A1202F2	Styrene	14.8	2	12/06/94
	GL	656A2208F2	Styrene	13.5	2	12/07/94
	GL	656A1202F2	Tetrachloroethene	5.6	2	12/06/94
	GL	656A3209F2	Tetrachloroethene	6.5	2	12/08/94
	GL	656A2208F2	Tetrachloroethene	10.5	2	12/07/94
	GL	656A3209F2	Toluene	5.7	2	12/08/94
	GL	656A2208F2	Toluene	19.9	2	12/07/94
	GL	656A1202F2	Toluene	18.4	2	12/06/94
	GL	656A2208F2	Trichloroethene	1.3	2	12/07/94
	GL	656A1202F2	Trichlorofluoromethane	5.2	2	12/06/94
	GL	656A3209F2	Trichlorofluoromethane	4.2	2	12/08/94
	GL	656A2208F2	Trichlorofluoromethane	7.1	2	12/07/94
	GL	656A1202F2	m+p-Xylenes	3.8	2	12/06/94
	GL	656A2208F2	m+p-Xylenes	3.1	2	12/07/94
	GL	656A3209F2	m+p-Xylenes	1.0	2	12/08/94
	GL	656A1202F2	p-Ethyltoluene	2.7	2	12/06/94
	GL	656A2208F2	p-Ethyltoluene	1.5	2	12/07/94
	GL	656A3209F2	p-Ethyltoluene	2.7	2	12/08/94
	BZ	656A1106F2	1,1,1-Trichloroethane	1.5	2	12/06/94
warehouse interior	BZ	656A3104F2	1,1,1-Trichloroethane	1.8	2	12/08/94

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SAMPLE LOCATION	SAMPLE TYPE	ENSAFE ID	PARAMETER	(ug/m3)	SAMPLING PHASE	DATE
	BZ	656A3104F2	1,2,4-Trichlorobenzene	1.7	2	12/08/94
	BZ	656A3104F2	Benzene	0.9	2	12/08/94
	BZ	656A1106F2	Benzene	0.8	2	12/06/94
	BZ	656A1106F2	Benzene, 1,2,4-trimethyl	1.6	2	12/06/94
	BZ	656A3104F2	Benzene, 1,2,4-trimethyl	2.6	2	12/08/94
	BZ	656A3104F2	Benzene, 1,3,5-trimethyl-	1.0	2	12/08/94
	BZ	656A3104F2	Chloromethane	0.6	2	12/08/94
	BZ	656A1106F2	Chloromethane	0.7	2	12/06/94
	BZ	656A2106F2	Chloromethane	0.6	2	12/07/94
	BZ	656A1106F2	Dichlorodifluoromethane	3.7	2	12/06/94
	BZ	656A2106F2	Dichlorodifluoromethane	2.2	2	12/07/94
	BZ	656A3104F2	Dichlorodifluoromethane	2.8	2	12/08/94
	BZ	656A3104F2	Methylene chloride	1.8	2	12/08/94
	BZ	656A2106F2	Methylene chloride	1.5	2	12/07/94
	BZ	656A1106F2	Methylene chloride	1.3	2	12/06/94
	BZ	656A1106F2	Styrene	8.2	2	12/06/94
	BZ	656A2106F2	Styrene	4.1	2	12/07/94
	BZ	656A1106F2	Tetrachloroethene	1.7	2	12/06/94
	BZ	656A3104F2	Tetrachloroethene	1.8	2	12/08/94
	BZ	656A3104F2	Toluene	8.9	2	12/08/94
	BZ	656A2106F2	Toluene	6.9	2	12/07/94
	BZ	656A1106F2	Toluene	22.4	2	12/06/94
	BZ	656A3104F2	Trichlorofluoromethane	2.9	2	12/08/94

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Chemicals Detected In and Around Building 656
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SAMPLE LOCATION	SAMPLE TYPE	ENSAFE ID	PARAMETER	(ug/m3)	SAMPLING PHASE	DATE
	BZ	656A2106F2	Trichlorofluoromethane	2.3	2	12/07/94
	BZ	656A1106F2	Trichlorofluoromethane	2.7	2	12/06/94
	BZ	656A1106F2	m+p-Xylenes	2.0	2	12/06/94
	BZ	656A3104F2	m+p-Xylenes	1.7	2	12/08/94
	BZ	656A2106F2	m+p-Xylenes	1.0	2	12/07/94
	BZ	656A3104F2	p-Ethyltoluene	2.7	2	12/08/94
	BZ	656A1106F2	p-Ethyltoluene	1.6	2	12/06/94
	GL	656A3206F2	1,1,1-Trichloroethane	1.5	2	12/08/94
	GL	656A1207F2	1,1,1-Trichloroethane	1.2	2	12/06/94
	GL	656A1207F2	Chloromethane	0.43	2	12/06/94
	GL	656A3206F2	Dichlorodifluoromethane	1.9	2	12/08/94
	GL	656A1207F2	Dichlorodifluoromethane	3.3	2	12/06/94
	GL	656A2207F2	Dichlorodifluoromethane	1.7	2	12/07/94
	GL	656A2207F2	Methylene chloride	0.9	2	12/07/94
	GL	656A1207F2	Methylene chloride	1.1	2	12/06/94
	GL	656A1207F2	Styrene	4.0	2	12/06/94
	GL	656A1207F2	Tetrachloroethene	1.4	2	12/06/94
	GL	656A3206F2	Toluene	1.3	2	12/08/94
	GL	656A1207F2	Toluene	19.6	2	12/06/94
	GL	656A2207F2	Toluene	1.3	2	12/07/94
	GL	656A1207F2	Trichlorofluoromethane	2.6	2	12/06/94
	GL	656A2207F2	Trichlorofluoromethane	2.1	2	12/07/94
	GL	656A3206F2	Trichlorofluoromethane	2.1	2	12/08/94

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Chemicals Detected In and Around Building 656
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SAMPLE LOCATION	SAMPLE TYPE	ENSAFE ID	PARAMETER	(ug/m3)	SAMPLING PHASE	DATE
	BZ	6560225-07	Methylene Chloride	8.0	1	2/25/94 - 2/26/94
warehouse interior near store's entrance	BZ	6560224-07	Methylene Chloride	7.0	1	2/24/94 - 2/25/94
	BZ	6560223-07	Toluene	36.0	1	2/23/94 - 2/24/94
	BZ	6560224-07	Toluene	13.0	1	2/24/94 - 2/25/94
	BZ	6560223-07	Trichloroethene	8.0	1	2/23/94 - 2/24/94
	GL	6560224-01	Methylene Chloride	6.0	1	2/24/94 - 2/25/94
	GL	6560223-01	Toluene	16.0	1	2/23/94 - 2/24/94
	BZ	6560224-04	Methylene Chloride	13.0	1	2/24/94 - 2/25/94
store area, uniforms, dressing room	BZ	6560225-04	Toluene	10.0	1	2/25/94 - 2/26/94
	BZ	6560223-04	Toluene	7.0	1	2/23/94 - 2/24/94
	GL	6560225-05	Methylene Chloride	6.0	1	2/25/94 - 2/26/94
	GL	6560224-05	Methylene Chloride	8.0	1	2/24/94 - 2/25/94
	GL	6560223-05	Toluene	8.0	1	2/23/94 - 2/24/94
	GL	6560225-05	Toluene	7.0	1	2/25/94 - 2/26/94
	SSint	656A3305F2	1,1,1-Trichloroethane	1.3	2	12/08/94
Sub-slab inside warehouse	SSint	656A1308F2	Dichlorodifluoromethane	2.8	2	12/06/94
	SSint	656A3305F2	Dichlorodifluoromethane	1.8	2	12/08/94
	SSint	656A2305F2	Dichlorodifluoromethane	1.6	2	12/07/94
	SSint	656A3305F2	Methylene chloride	1.2	2	12/08/94
	SSint	656A1308F2	Methylene chloride	1.0	2	12/06/94
	SSint	656A2305F2	Methylene chloride	1.2	2	12/07/94
	SSint	656A1308F2	Toluene	7.2	2	12/06/94
	SSint	656A2305F2	Trichlorofluoromethane	2.0	2	12/07/94

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Chemicals Detected In and Around Building 656
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SAMPLE LOCATION	SAMPLE TYPE	ENSAFE ID	PARAMETER	(ug/m3)	SAMPLING PHASE	DATE
	SSint	656A3305F2	Trichlorofluoromethane	2.4	2	12/08/94
	SSint	656A1308F2	Trichlorofluoromethane	2.3	2	12/06/94
Sub-slab west of Bldg. 656	SSext	656A3303F2	1,1,1-Trichloroethane	1.1	2	12/08/94
	SSext	656A3303F2	Benzene	0.7	2	12/08/94
	SSext	656A2302F2	Chloromethane	0.7	2	12/07/94
	SSext	656A3303F2	Chloromethane	0.6	2	12/08/94
	SSext	656A3303F2	Dichlorodifluoromethane	1.8	2	12/08/94
	SSext	656A2302F2	Dichlorodifluoromethane	1.7	2	12/07/94
	SSext	656A2302F2	Methylene chloride	1.0	2	12/07/94
	SSext	656A3303F2	Methylene chloride	1.3	2	12/08/94
	SSext	656A3303F2	Toluene	1.1	2	12/08/94
	SSext	656A2302F2	Toluene	1.8	2	12/07/94
	SSext	656A2302F2	Trichlorofluoromethane	2.2	2	12/07/94
	SSext	656A3303F2	Trichlorofluoromethane	2.5	2	12/08/94
Sub-slab east side of Bldg. 656	SSext	656A3302F2	1,1,1-Trichloroethane	1.4	2	12/08/94
	SSext	656A1305F2	Chloromethane	0.7	2	12/06/94
	SSext	656A1305F2	Dichlorodifluoromethane	1.8	2	12/06/94
	SSext	656A2304F2	Dichlorodifluoromethane	2.4	2	12/07/94
	SSext	656A3302F2	Dichlorodifluoromethane	1.7	2	12/08/94
	SSext	656A2304F2	Methylene chloride	1.7	2	12/07/94
	SSext	656A3302F2	Methylene chloride	1.1	2	12/08/94
	SSext	656A1305F2	Methylene chloride	1.8	2	12/06/94
	SSext	656A1305F2	Toluene	1.3	2	12/06/94

Table 17
Indoor Air Quality Assessment
Chemicals Detected In and Around Building 656
Charleston Naval Complex
Charleston, South Carolina

SAMPLE LOCATION	SAMPLE TYPE	ENSAFE ID	PARAMETER	(ug/m3)	SAMPLING PHASE	DATE
	SSext	656A2304F2	Toluene	0.9	2	12/07/94
	SSext	656A3302F2	Trichlorofluoromethane	2.5	2	12/08/94
	SSext	656A1305F2	Trichlorofluoromethane	2.4	2	12/06/94
	SSext	656A2304F2	Trichlorofluoromethane	3.4	2	12/07/94

NOTE:

- Refer to Section 3.2.3 for detailed sample location descriptions.

ethylbenzene, methylene chloride, styrene, tetrachloroethene, toluene, trichloroethene, trichlorofluoromethane, trichlorotrifluoroethane (Freon 113), meta- and para-xylenes, and para-ethyltoluene. Table 17 shows the range of detected concentrations of these compounds. With the exception of benzene, 1,3,5-trimethylbenzene, ethylbenzene, styrene, trichloroethane, and trichlorotrifluoroethane, the identified compounds were detected in all three daily BZ samples.

4.8.1.2 Warehouse Interior

Phase I

Three successive daily BZ samples were collected in the warehouse area (samples 6560223-07, 6560224-07, and 6560225-07) starting on 2/23/94. Methylene chloride, trichloroethene and toluene were the only chemicals detected in BZ samples from this area during Phase I. Methylene chloride was detected on the last two days at the sampling location, but was absent in the initial Phase I sample. Toluene was detected in the first and second Phase I samples only. Trichloroethene was detected exclusively in the first Phase I sample.

Phase II

Three successive daily BZ samples (samples 656A1106F2, 656A2106F2, and 656A3104F2) were collected starting on 12/6/94 at this location. The following compounds were detected: 1,1,1-trichloroethane, 1,2,4-trichlorobenzene, benzene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, chloromethane, dichlorodifluoromethane, methylene chloride, styrene, tetrachloroethene, toluene, trichlorofluoromethane, meta- and para-xylenes, and para-ethyltoluene. Table 17 shows the range of detected concentrations of these compounds. Chloromethane, dichlorodifluoromethane, methylene chloride, toluene, trichlorofluoromethane, and meta- and para-xylenes were detected in all three BZ samples. 1,1,1-Trichloroethane, benzene, 1,2,4-trimethylbenzene, styrene, tetrachloroethene, and para-ethyltoluene were detected in the first and last daily BZ samples. Styrene was detected in the first two BZ samples from this location. 1,2,4-Trichlorobenzene and 1,3,5-trimethylbenzene were each detected once in the 12/8/94 sample.

4.8.1.3 Uniforms/Dressing Room Area

Phase I

Three successive daily BZ samples were collected in the dressing room area (samples 6560223-04, 6560224-04, and 6560225-04) starting on 2/23/94. Methylene chloride and toluene were the only chemicals detected in BZ samples from this area during Phase I. Methylene chloride was detected exclusively in the sample initiated on 2/24/94 while toluene was detected in the first and last samples.

Phase II

No BZ sampling was performed in the dressing room area during the Phase II IAQ survey.

4.8.2 Distribution of Chemicals at Ground Level

4.8.2.1 Bicycle Display Area

Phase I

No GL samples were collected in this area during Phase I.

Phase II

Three successive daily GL samples (samples 656A1202F2, 656A2208F2, and 656A3209F2) were collected starting on 12/6/94 at this location. 1,1,1-Trichloroethane, 1,4-dichlorobenzene, benzene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, chloromethane, dichlorodifluoromethane, ethylbenzene, methylene chloride, styrene, tetrachloroethene, toluene, trichloroethene, trichlorofluoromethane, meta- and para-xylenes, and para-ethyltoluene were each detected in GL samples collected in the bicycle display area during Phase II. Table 17 shows the range of detected concentrations of these compounds. Except for benzene, 1,3,5-trimethylbenzene, ethylbenzene, and trichloroethene, each compound was detected in all three daily GL samples. Benzene was detected in the first two GL samples while 1,3,5-trimethylbenzene was reported in the first and last. Ethylbenzene was detected exclusively in the initial sample, and trichloroethane was detected in the middle sample.

4.8.2.2 Warehouse Interior

Phase I

Three successive daily GL samples were collected in the warehouse area (samples 6560223-01, 6560224-01, and 6560225-01) starting on 2/23/94. Methylene chloride and toluene were the only chemicals detected in GL samples from this area during Phase I, and were each detected only one time. Methylene chloride was detected on the second sampling day, and toluene was detected in the initial Phase I sample only.

Phase II

Three successive daily GL samples (samples 656A1207F2, 656A2207F2, and 656A3206F2) were collected starting on 12/6/94 at this location. 1,1,1-Trichloroethane, chloromethane, dichlorodifluoromethane, methylene chloride, styrene, tetrachloroethene, toluene, and trichlorofluoromethane were detected in GL samples collected in the warehouse area during Phase II. Table 17 shows the range of detected concentrations of these compounds. Dichlorodifluoromethane, toluene, and trichlorofluoromethane were detected in all three GL samples. 1,1,1-Trichloroethane was detected in samples collected on the first and last sampling dates. Methylene chloride was reported in the first two samples collected from this location. Chloromethane, styrene, and tetrachloroethene were each detected exclusively in the initial sample from this location.

4.8.2.3 Uniforms/Dressing Room Area

Phase I

Three successive daily GL samples were collected in the dressing room area (samples 6560223-05, 6560224-05, and 6560225-05) starting on 2/23/94. Methylene chloride and toluene were the only chemicals detected in GL samples from this area during Phase I. Methylene chloride was detected in the last two Phase I samples collected. Toluene was detected in the initial GL sample and the last.

Phase II

No GL sampling was performed in the dressing room area during the Phase II IAQ survey.

4.8.3 Distribution of Chemicals in Sub-slab Samples

Phase I

No sub-slab sampling was performed as part of the Phase I IAQ survey.

Phase II

Both interior and exterior sub-slab samples were collected during Phase II IAQ sampling. One SS_{int} and two SS_{ext} sample locations were monitored. Three successive daily SS_{int} samples were collected (samples 656A1308F2, 656A2305F2, and 656A3305F2) starting on 12/6/94. These samples were obtained by gaining access to the sub-slab void through a crack in the warehouse floor. 1,1,1-Trichloroethane, dichlorodifluoromethane, methylene chloride, toluene and trichlorofluoromethane were detected at the SS_{int} location in the warehouse area. 1,1,1-Trichloroethane and toluene were the only compounds not identified in each sample. Toluene was identified in the initial sample from this location and 1,1,1-trichloroethane was detected in the last.

Three successive daily SS_{ext} samples were also collected over the Phase II sampling period at locations east and west of Building 656. Both exterior sub-slab sampling points were located beneath the warehouse portion of Building 656. Sampling in the sub-slab void west of the building (samples 656A1304F2, 656A2302F2, and 656A3303F2) was initiated on 12/6/94. Results for the initial sample were not reported. Each of the latter two samples was found to contain chloromethane, dichlorodifluoromethane, methylene chloride, toluene, and trichlorofluoromethane. 1,1,1-trichloroethane and benzene were detected exclusively in the last sample collected from this location.

Exterior sub-slab samples 656A1305F2, 6562304F2, and 656A3302F2 were collected from the void space beneath the east side of Building 656 starting on 12/6/94. Dichlorodifluoromethane, methylene chloride and trichlorofluoromethane were detected in each daily SS_{ext} sample from this location. Toluene was detected in samples collected on the first two sampling days. Chloromethane was identified exclusively in the first sample collected, and 1,1,1-trichloroethane was reported only in the last.

4.8.4 Distribution of Carbon Dioxide

The Phase I IAQ survey included carbon dioxide monitoring throughout Building 656. The building was characterized as a large enclosed space with relatively low occupancy (including employees and customers). Carbon dioxide concentrations ranged from 400 to 670 ppm, which is below the ASHRAE recommended concentration of less than 1,000 ppm. In a typical office building, carbon dioxide concentrations below 800 ppm are considered low and indicative of a well-ventilated space. The concentrations recorded in Building 656 indicate adequate ventilation under typical occupancy conditions.

4.8.5 Building 656 Summary

The results of the Building 656 Phase I and II IAQ surveys may be summarized with comparison between phase results and correlation of interior and sub-slab data. The following paragraphs summarize the interior area studied.

In the bicycle display area, Phase II BZ and GL sample results confirmed the presence of methylene chloride and toluene detected during Phase I sampling effort. Of the additional compounds detected during Phase II sampling (BZ and GL), 1,1,1-trichloroethane, benzene, chloromethane, dichlorodifluoromethane, and trichlorofluoromethane could be correlated with potential sub-slab sources identified beneath the warehouse. Although subslab sampling detected 1,1,1-trichloroethane, benzene, chloromethane, dichlorodifluoromethane, and trichlorofluoromethane, the concentrations were generally less than corresponding BZ and GL sample concentrations. It can therefore be concluded that building operations related activities are likely the source of these compounds detected in BZ and GL samples.

There were a number of compounds detected in the bicycle display area during Phase II, however, for which no potential external source could be postulated. These compounds included 1,4-dichlorobenzene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, ethylbenzene, styrene, tetrachloroethene, trichloroethane, trichlorotrifluoroethane (Freon 113), meta- and para-xylenes, and para-ethyltoluene. Based on the results of the IAQ surveys, an operations-related source of these compounds is indicated rather than an external source associated with past hazardous waste activities in the vicinity of Building 656.

Phase II BZ samples confirmed the presence of methylene chloride and toluene reported in Phase I results for the warehouse area. In addition, a potential sub-slab source was found to exist for these compounds as well as 1,1,1-trichloroethane, benzene, chloromethane, dichlorodifluoromethane, and trichlorofluoromethane which was also detected in Phase II BZ and GL samples. This correlation suggests possible infiltration of accumulated soil gases from the sub-slab void space to the occupied areas of Building 656. However, because compounds were detected in subslab samples at concentrations below those detected in BZ and GL samples, building operations related activities are likely the source of the compounds detected in the building interior.

No potential sub-slab source was identified for 1,2,4-trichlorobenzene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, styrene, tetrachloroethene or para-ethyltoluene hits reported in Phase II warehouse samples (BZ and GL). Based on the results of the IAQ surveys, an operations-related source of these compounds is indicated rather than an external source associated with past hazardous waste activities in the vicinity of Building 656.

Sampling in the dressing room area was limited to Phase I only. Potential sub-slab sources of methylene chloride and toluene do, however, exist indicating that these compounds may be associated with soil-gas infiltration from the sub-slab void space. However, methylene chloride and toluene were detected in subslab samples at concentrations below those detected in BZ and GL samples, building operations related activities are likely the source of these compounds detected in the building interior.

Each compound detected in SS_{int} and SS_{ext} samples was detected in at least one sample from the interior of Building 656. It should be noted, however, that the concentrations detected in the sub-slab void space were generally less than those reported in the building interior. SWMU 655 (Ruptured Fuel Oil Line) is located in close proximity to the warehouse. There is little evidence, based on the contaminant distributions, that interior concentrations reported at Building 656 could be associated with motor fuel leakage into soil beneath the building.

4.9 Building 657

As shown in Table 18, the following chemicals were detected at least once in BZ, GL, SS_{int} SS_{ext} samples collected during Phase I and II IAQ surveys in Building 657: 1,2,4-trimethylbenzene, 1,2,4-trichlorobenzene, 1,4-dichlorobenzene, chloromethane, chloroform, dichlorodifluoromethane, methylene chloride, styrene, toluene, trichlorofluoromethane, and para- and meta-xylenes. The distribution of these compounds observed during each phase is discussed in the following sections by sample location and type. The night club area of Building 657 (Puzzles) was the exclusive focus for BZ and GL sampling during the IAQ surveys. In addition, one SS_{int} and one SS_{ext} sampling location were monitored during Phase II. Table 18 also provides the sample location, type, identification number, phase, and date for each hit reported during the IAQ surveys.

Table 18
Indoor Air Quality Assessment
Chemicals Detected In and Around Building 657
Charleston Naval Complex
Charleston, South Carolina

SAMPLE LOCATION	SAMPLE TYPE	ENSAFE ID	PARAMETER	(ug/m3)	SAMPLING PHASE	DATE
	BZ	657A1105F2	1,2,4-Trichlorobenzene	1.6	2	11/18/94
middle of dance floor	BZ	657A2106F2	1,4-Dichlorobenzene	135.3	2	11/29/94
	BZ	657A3105F2	1,4-Dichlorobenzene	78.2	2	11/30/94
	BZ	657A1105F2	1,4-Dichlorobenzene	114.2	2	11/18/94
	BZ	657A1105F2	Benzene, 1,2,4-trimethyl	1.1	2	11/18/94
	BZ	657A2106F2	Chloroform	1.1	2	11/29/94
	BZ	657A3105F2	Chloromethane	0.43	2	11/30/94
	BZ	657A2106F2	Chloromethane	0.6	2	11/29/94
	BZ	657A2106F2	Dichlorodifluoromethane	4.7	2	11/29/94
	BZ	657A1105F2	Dichlorodifluoromethane	5.3	2	11/18/94
	BZ	657A3105F2	Dichlorodifluoromethane	3.3	2	11/30/94
	BZ	657A3105F2	Styrene	1.9	2	11/30/94
	BZ	657A2106F2	Styrene	4.3	2	11/29/94
	BZ	657A2106F2	Toluene	1.5	2	11/29/94
	BZ	657A3105F2	Toluene	1.2	2	11/30/94
	BZ	657A1105F2	Toluene	1.8	2	11/18/94
	BZ	657A1105F2	Trichlorofluoromethane	70.8	2	11/18/94
	BZ	657A3105F2	Trichlorofluoromethane	14.8	2	11/30/94
	BZ	657A2106F2	Trichlorofluoromethane	24.6	2	11/29/94
	BZ	657A2106F2	m+p-Xylenes	1.1	2	11/29/94
	BZ	657A1105F2	m+p-Xylenes	1.9	2	11/18/94
	GL	6570224-01	Methylene Chloride	9.0	1	2/24/94 - 2/25/94
	GL	657A3207F2	1,4-Dichlorobenzene	4.3	2	11/30/94

Table 18
Indoor Air Quality Assessment
Chemicals Detected In and Around Building 657
Charleston Naval Complex
Charleston, South Carolina

SAMPLE LOCATION	SAMPLE TYPE	ENSAFE ID	PARAMETER	(ug/m3)	SAMPLING PHASE	DATE
	GL	657A2207F2	1,4-Dichlorobenzene	2.6	2	11/29/94
	GL	657A2207F2	Dichlorodifluoromethane	1.3	2	11/29/94
	GL	657A1204F2	Dichlorodifluoromethane	1.9	2	11/18/94
	GL	657A3207F2	Dichlorodifluoromethane	1.9	2	11/30/94
	GL	657A3206F2	Dichlorodifluoromethane	1.8	2	11/30/94
	GL	657A1204F2	Toluene	1.0	2	11/18/94
	GL	657A2207F2	Trichlorofluoromethane	4.4	2	11/29/94
	GL	657A3206F2	Trichlorofluoromethane	1.7	2	11/30/94
	GL	657A3207F2	Trichlorofluoromethane	2.7	2	11/30/94
	GL	657A1204F2	Trichlorofluoromethane	1.6	2	11/18/94
	SSext	657A1306F2	1,4-Dichlorobenzene	1.3	2	11/18/94
Sub-slab; near the exterior wall closest to commissary	SSext	657A1306F2	Dichlorodifluoromethane	1.5	2	11/18/94
	SSext	657A2308F2	Dichlorodifluoromethane	1.9	2	11/29/94
	SSext	657A2308F2	Toluene	0.9	2	11/29/94
	SSext	657A1306F2	Toluene	1.2	2	11/18/94
	SSext	657A1306F2	Trichlorofluoromethane	1.3	2	11/18/94
	SSext	657A2308F2	Trichlorofluoromethane	12.3	2	11/29/94
	SSext	657A1306F2	m+p-Xylenes	1.3	2	11/18/94
	SSext	657A3308F2	Dichlorodifluoromethane	1.7	2	11/30/94
	SSext	657A3308F2	Trichlorofluoromethane	1.7	2	11/30/94

NOTE:

- Refer to Section 3.2.3 for detailed sample location descriptions.

4.9.1 Distribution of Chemicals in the Breathing Zone

Phase I

Three successive daily BZ samples were collected in the night club area (samples 6570223-02, 6570224-02, and 6570225-02) starting on 2/23/94. The sampling point was located in the middle of the dance floor. No target compound was detected in any BZ sample.

Phase II

Three successive daily BZ samples (samples 657A1105F2, 657A2106F2, and 657A3105F2) were collected starting on 11/18/94. Due to the Thanksgiving holiday, no samples were collected between 11/19/94 and 11/28/94. Phase II sampling resumed on 11/29/94. 1,4-Dichlorobenzene, dichlorodifluoromethane, toluene, and trichlorofluoromethane were detected in each BZ sample. 1,2,4-Trichlorobenzene and 1,2,4-trimethylbenzene were detected exclusively in the initial sample from this location. Chloroform, chloromethane, styrene, and meta- and para-xylenes were detected with less frequency and solely in samples collected after the holiday.

4.9.2 Distribution of Chemicals at Ground Level

Phase I

Three successive daily GL samples (samples 6570223-01, 6570224-01, and 6570225-01) were collected starting on 2/23/94. The sampling point was located in the middle of the dance floor. Methylene chloride was the sole target compound detected, and was identified in the sample initiated on 2/24/94 only.

Phase II

Three successive daily GL samples (samples 657A1204F2, 657A2207F2, and 657A3206F2) were collected starting on 11/18/94. Due to the Thanksgiving holiday, no samples were collected between 11/19/94 and 11/28/94. Phase II sampling resumed on 11/29/94.

Dichlorodifluoromethane and trichlorofluoromethane were detected in each sample. Toluene was detected exclusively in the sample collected prior to the holiday. 1,4-Dichlorobenzene was detected in both samples collected after the holiday hiatus.

4.9.3 Distribution of Chemicals in Sub-slab Samples

Phase I

No sub-slab sampling was performed as part of the Phase I IAQ survey.

Phase II

One SS_{ext} sample location was sampled during Phase II IAQ sampling. Three successive daily SS_{ext} samples were collected (samples 657A1306F2, 657A2308F2, and 657A3308F2) starting on 11/18/94. Due to the Thanksgiving holiday, no samples were collected between 11/19/94 and 11/28/94. Phase II sampling resumed on 11/29/94. These samples were obtained through a sub-slab access point near the commissary also housed in Building 657.

Dichlorodifluoromethane and trichlorofluoromethane were detected in each sample. 1,4-Dichlorobenzene and meta- and para-xylenes were identified only in the sample collected prior to the holiday break. Toluene was detected in the sample prior to and one sample after the holiday hiatus.

4.9.4 Distribution of Carbon Dioxide

No carbon dioxide monitoring was performed in Building 657 during the Phase I IAQ survey. The area in question (Puzzles' dance floor) was unoccupied throughout the sampling period and doors were left open. Carbon dioxide results obtained under these circumstances would be of limited use in evaluating the adequacy of the building's mechanical ventilation system.

4.9.5 Building 657 Summary

The methylene chloride detections reported during Phase I were not confirmed by Phase II BZ or GL results. Furthermore, no sub-slab source of methylene chloride was identified. 1,2,4-Trichlorobenzene, 1,2,4-trimethylbenzene, chloroform, chloromethane, and styrene hits reported in Phase II samples could not be correlated with any potential sub-slab source. Based on this observation, a building operations-related source is indicated.

A potential external source of 1,4-dichlorobenzene, dichlorodifluoromethane, toluene, trichlorofluoromethane, and para- and meta-xylenes detected in BZ and GL samples was identified. Each compound was detected in at least one associated SS_{ext} sample. It should be noted that the maximum concentrations of each compound detected in both interior and exterior samples were reported in either BZ or GL samples. Concentrations were consistently lower in sub-slab samples. This indicates that although a potential exterior source may exist for each, the most plausible explanation is that contaminant migration from the building interior accounts for void space levels. Based on available information, it cannot be definitively determined which scenario represents actual conditions.

5.0 BASELINE RISK ASSESSMENT

5.1 Introduction

A baseline risk assessment (BRA) analyzes the potential adverse effects on actual or hypothetical human receptors that could arise from exposures to chemicals detected during FFI air sampling if no remedial actions are taken to reduce reported concentrations. The baseline risk in Buildings 36, NS 84, 202, 643, 644, 645, 656, and 657 is the risk to human receptors (real or hypothetical) that may result due to the presence of indoor air contaminants where soil-gas migration and accumulation from external sources may occur if no remedial actions are taken to reduce the extent of existing environmental contamination near the complex. The following baseline risk assessment was prepared in accordance with the guidelines set forth in:

- *Risk Assessment Guidance for Superfund, Volume I-Human Health Evaluation Manual, Part A*, EPA/OERR, EPA/540/1-89/002 (December 1989) (Interim). (RAGS Part A).

- *Risk Assessment Guidance for Superfund, Volume I-Human Health Evaluation Manual, (Part B, Development of Risk-based Preliminary Remediation Goals)*, EPA/OERR, EPA/540/R92/003 (December 1991) (Interim).(RAGS Part B)

- *Risk Assessment Guidance for Superfund, Volume I-Human Health Evaluation Manual, Supplemental Guidance-Standard Default Exposure Factors-Interim Final,* EPA/OERR, OSWER Directive: 9285.6-03 (March 25, 1991) (RAGS Supplement)

- Supplemental Guidance to RAGS: Region IV Bulletin, Development of Health based Preliminary Remediation Goals, Remedial Goal Options and Remediation Levels (Supplemental RGO Guidance)

- EPA Region III Contaminant of Concern Screening Table, March 18, 1994, (Roy L. Smith); (RBC Screening Tables).

Objectives

The purpose of this risk assessment is assess and quantify potential human exposure to airborne contaminants emanating from external sources at Buildings 36, NS84, 202, 643, 644, 645, 656, and 657. This effort was supported by air sampling data obtained during Phase I and Phase II IAQ surveys as part of the FFI. Preceding sections have discussed the results of these sampling efforts which form the basis for this risk assessment. A human health risk assessment, as defined by RAGS Part A, includes the following steps:

- **Site characterization** — The data regarding site geography, geology, hydrogeology, climate, and demographics of populations in the area are evaluated.

- **Data collection** — The sample results for environmental media, including background samples, are analyzed.

- **Data evaluation** — The analytical data are analyzed statistically to identify the nature and extent of contamination and establish a preliminary list of chemicals of potential concern (COPCs) that will subsequently be refined to identify chemicals of concern (COCs).

- **Exposure assessment** — The potential receptors are identified under current and future conditions, potential exposure pathways are identified, exposure point concentrations and chemical intakes are quantified.

- **Toxicity assessment** — The adverse effects of the COPCs are qualitatively evaluated, and quantitative estimates of the relationship between exposure and severity or probability of effect are made.

- **Risk characterization** — The output of the exposure assessment and the toxicity assessment are combined to quantify the total noncancer and cancer risk to the hypothetical receptors.

- **Risk Uncertainty** — The areas of recognized uncertainty in human health risk assessments in addition to medium and exposure pathway specific influences are discussed and evaluated.

- **Risk/Hazard Summary** — Results of the quantification of exposure (risk and hazard) for the potential receptors and their exposure pathways identified under the current and future conditions are presented and discussed.

The value of the risk assessment as a basis for making remedial decisions depends on an adequate characterization of chemical contamination. Variables considered in characterizing the study area and its associated risk are the amount, type, and location of sources, the potential pathways of exposure (media type and migration routes), and the type, sensitivities, exposure duration, and dynamics of the potentially exposed populations (receptors). The FFI presented in previous chapters provided the site characterization data used in this assessment.

The focus of the FFI was the assessment of the possible effects to persons working in the State Department Buildings and other buildings in the immediate area of SWMU 9 (Closed Landfill), and several other SWMUs and AOCs that are currently the subject of investigation as part of the overall Zone H RFI (FFI study area).

5.2 Identification of Chemicals of Potential Concern

When performing a baseline risk assessment, data for environmental media are compiled to determine potential site-related chemicals and potential exposures for each medium as outlined in RAGS Part A. Since the objective of this risk assessment was to estimate risk posed by airborne chemicals detected in buildings in the FFI study area, no sub-slab results were included in the risk assessment dataset. Sub-slab results were used, however, to determine whether air contaminants detected in BZ and GL samples have a potential external source. Risk screening (described below) and the quantification of risk were based on BZ and GL sample data only.

Data Sources

Data for the FFI were gathered in accordance with sections of the USEPA- and SCDHEC-approved FFI Strategy included as Appendix G of the final Zone H RFI Workplan. The objectives and methods of sample collection are discussed in detail in Section 3.0 of this report. Phase II air data were previously presented in Tables 11 through 18 of this FFI by building. Due to uncertainties surrounding the validity of Phase I IAQ survey data, only results from Phase II sampling were used to quantify potential exposure in this risk assessment.

Data Validation

Data validation is an after-the-fact, independent, systematic process of evaluating data and comparing them to previously established criteria to confirm that the data are of the technical quality necessary to support the decisions made in the RFI process. Specific parameters associated with the data are reviewed to determine whether they meet the stipulated data quality objectives. The quality objectives address five principal parameters: precision, accuracy, completeness, comparability, and representativeness. To verify that these objectives are met, field measurements, sampling and handling procedures, laboratory analysis and reporting, and nonconformances and discrepancies in the data are examined to determine compliance with appropriate and applicable procedures. The procedures and criteria for validation are defined in the Functional Guidelines discussed in Section 3.2.5 of this FFI report. This section also provided further discussion of data validation.

Site-Related Data

All data were evaluated for suitability for use in the quantitative baseline risk assessment. Data obtained via the following analytical methods are not considered appropriate for the quantitative baseline risk assessment:

- Analytical methods that are not specific for a particular chemical, such as total organic carbon or total organic halogen

- Field screening instruments including total organic vapor monitoring units (HNu) and organic vapor analyzers.

Phase I IAQ survey data (Method TO-14 analyses) were deemed unusable for risk assessment purposes. Because the initial sampling phase was designed as a screening assessment, minimal quality assurance/quality control data was produced. In the absence of QA/QC information, it was not possible to subject the data to rigorous validation. Use of unvalidated data for risk assessment is considered inappropriate.

Once the data set is complete, statistical methods were used to evaluate the FFI analytical results to: (1) identify COPCs and (2) establish exposure point concentrations of potential receptor locations. The statistical methods used in data evaluation are discussed below. The rationale used to develop this methodology and the statistical techniques were based on the following sources:

- RAGS Part A
- Statistical Methods for Environmental Pollution Monitoring (Gilbert, 1987)

For each set of data used to describe the concentration of chemicals in a building, the following information was tabulated: frequency of detection, range of detected values, and mean concentrations. Statistical determinations of the UCL were not possible for all chemicals detected in all buildings due to the limited number of samples collected and the limited number of chemicals detected. The maximum three day mean concentration detected at a particular location in a building (BZ or GL) was used as the exposure point concentration (EPC) to calculate potential exposure. This is discussed in detail in the Quantification of Exposure Section of this BRA.

The second phase sample results were reported in parts per billion volume (ppbv) by the analytical laboratory. Because the units of USEPA risk-based screening concentrations are $\mu g/m^3$, Phase II results were converted to $\mu g/m^3$ using molecular weight (MW) as shown in the formula below. The formula was excerpted from the American Conference of Governmental Industrial Hygienist's publication, *Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, 1994-1995.*

$$\mu g/m^3 = [\ (ppbv) \times (MW)\ /\ 24.45\ ]$$

Selection of Chemicals of Potential Concern

The objective of this section of the baseline risk assessment is to screen information that is available on the substances detected at each building (chemicals present in site samples or CPSS) to develop a list or group of chemicals referred to as chemicals of potential concern. The information discussed within this section consists of USEPA Region III risk-based ambient air screening concentrations (RBC Screening Tables), and occupational screening values derived through application of standard occupational default exposure assumptions. COPC are chemicals selected in consideration of their comparison to screening concentrations, intrinsic toxicological properties, persistence, fate and transport characteristics, and cross-media transfer potential. Any COPC found to contribute to a pathway that exceeds a 10^{-4} risk or hazard index (HI) greater than 1 for any of the buildings evaluated in this risk assessment (and has an incremental lifetime cancer risk (ILCR) greater than 10^{-6} or HQ greater than 0.1) was considered to be a chemical of concern (COC).

Before evaluating the potential air risks/hazards in the buildings, it was first necessary to determine the nature and extent of the contamination at the sites. This was accomplished by noting the chemicals detected in each medium. These chemicals will represent the CPSS for each building. The nature and extent of CPSS have been discussed in detail in Section 4.0 of this FFI. To reduce the list of CPSS and to limit the focus of the formal assessment, the following tasks were performed.

Comparison of Site-Related Data to Screening Concentrations

The maximum concentrations of CPSS detected in air at each building sampled was compared to USEPA Region III risk-based residential ambient air COC screening concentrations (RBCs) issued in March 18, 1994. In addition, industrial RBCs were calculated using the formula shown in the USEPA Region III document. The residential RBCs are based on assumptions described in detail in the referenced document, and industrial (occupational) RBCs were not provided in the document. However, industrial exposure assumptions and formulae were provided in the RBC screening tables document. These assumptions and formulae were used to calculate industrial RBCs.

The occupational RBCs are based on standard industrial exposure assumptions. These include a worker being exposed for eight hours per day for 250 days per year. Assuming that the exposure conditions remain unchanged for 25 years and the inhalation rate for adults is 20 m^3 per 24-hour period, occupational RBCs were calculated for all chemicals detected for which toxicological data were available. Occupational RBCs were calculated with a target risk of 10^{-6} for carcinogenic and a target hazard quotient of 0.1.

For each chemical, this screening approach includes both concentration-dependent and chemical-specific toxicity considerations as a means of determining the COPC list. The screening concentrations were used as a tool to focus the risk assessment on chemicals that are most likely to pose significant risk.

If both carcinogenic and noncarcinogenic RBC have been calculated for a particular chemical, the lesser of the two values is considered the appropriate RBC for the given contaminant. All CPSS were subjected to the RBC screening regardless of whether a potential external source was identified. Those CPSS whose maximum detected air concentrations exceed either the residential or occupational chemical-specific RBCs were evaluated further in the screening process with respect to the potential for an external source. Screening was performed on all maximum reported concentrations of chemicals detected in each building. All chemicals detected in breathing zone or ground level samples and corresponding sub-slab samples were assumed to have an external source. A compound was deemed to be a COPC if it was detected at least once in excess of an RBC **and** was identified in at least one subslab sample from the same building. This screening process did not take into consideration the relative concentrations of a chemical between interior and exterior samples. As discussed in Section 4.0, numerous chemicals were detected in both interior (BZ or GL) and subslab (SS_{int} or SS_{ext}) samples. In many instances, however, the maximum concentrations were reported in interior samples. Due to the potential dilution effects associated with a larger interior air volume and HVAC air exchanges when a compound migrates from the subslab to interior locations, lower concentrations in the subslab are considered indicative of an internal rather than external source. Retention of compounds found to have higher interior sample concentrations was considered appropriate in keeping with the conservative approach established for this effort.

Compounds detected exclusively in building interior samples were not considered COPCs under any circumstances. The results of RBC screening analysis for compounds without an identified external source are presented in the following section. If the maximum concentration of a compound detected solely indoors exceeded either RBC, it was noted in the screening tables discussed below. These chemicals may warrant further evaluation relative to identification of potential sources associated with building operations.

Tables 19 through 26 summarize the RBC screening and potential source identification process used to determine COPCs.

The following sections describe the results of this process by building. Chemicals for which no potential external sources was identified were not considered COPCs. Any chemical with maximum detected concentrations above the lowest RBC was retained as a COPC, and was noted by an asterisk "*". If the chemical was detected in the sub-slab it was noted in the table by the numerical symbol of "3". The chemicals eliminated from further consideration in this assessment due to the maximum detected concentrations falling below residential RBCs and/or derived occupational RBCs are noted by the numerical symbols of "4" and/or "5", respectively.

5.2.1 COPCs Identified in Building 36

Of the compounds detected in interior BZ or GL samples, 1,4-dichlorobenzene and chloroform were the only compounds detected in corresponding sub-slab samples with maximum concentrations exceeding the occupational RBC at Building 36. Benzene, chloroform, chloromethane and 1,4-dichlorobenzene were detected in BZ and GL samples at concentrations exceeding the residential RBC, and were also found to have a potential external (subslab) source. As a result, benzene, chloroform, chloromethane and 1,4-dichlorobenzene are considered COPCs for Building 36.

No compound without an identified external source was found to exceed the residential or occupational ambient air RBC.

Table 19

Chemicals Detected In Phase II Ambient Air Samples, Inside Building 36

Comparison to Screening Concentrations

CNC FFI (IAQ)

Charleston, South Carolina

	Chemical	Frequency of Detection (1)	Default Concentration (ug/m3) (2)	Range of Detected Concentrations (ug/m3)	RBCr (ug/m3)	RBCi (ug/m3)	Notes
	1,1,1-Trichloroethane	2 / 6		2.9 - 2.9	100	438	3 4 5
*	Benzene	1 / 6	0.34	0.7 - 0.7	0.22	1.47	3 5
*	Chloroform	2 / 6	0.81	1.6 - 2.7	0.078	0.53	3
*	Chloromethane	6 / 6	0.24	0.47 - 1.1	0.99	6.81	3 5
*	1,4-Dichlorobenzene	6 / 6	3.01	9 - 394	0.26	1.79	3
	Dichlorodifluoromethane	6 / 6		1.8 - 14.2	21	87.5	3 4 5
	Methylene chloride	4 / 6		0.9 - 2.4	3.8	26.2	3 4 5
	Styrene	1 / 6		1.7 - 1.7	100	438	4 5
	Toluene	6 / 6		0.8 - 1.8	42	175	3 4 5
	Trichlorofluoromethane	6 / 6		2.1 - 15.7	73	307	3 4 5
	m+p-Xylenes	2 / 6		1 - 1.6	73	3066	3 4 5

NOTES:

* Based on the comparison to residential screening concentrations and the potential for an external source (i.e., a source other than internal building operations) this chemical is a COPC, and it will be carried through the formal BRA process.

1 Frequency of detection indicates the number detected over the number analyzed

2 Default concentration indicates the lesser of one-half the lowest detected concentration and one-half the lowest detection limit; used to calculate the mean of the natural log transformed data for applicable COPC (if applicable)

3 This chemical was detected in sub-slab samples; risk will not be quantified for chemicals not detected in sub-slab samples as the corresponding sub-slab data for this building did not identify the presence of a potential external source.

4 The maximum concentration detected does not exceed the residential screening value.

Table 19
Chemicals Detected In Phase II Ambient Air Samples, Inside Building 36
Comparison to Screening Concentrations
CNC FFI (IAQ)
Charleston, South Carolina

5	The maximum concentration detected does not exceed the industrial screening value.
NA	Not available
RBC	USEPA Region III Risk based screening concentration for ambient air, March 1994 version; based on target risk of 1E-6 and target hazard quotient of 0.1.
r	Residential Based RBC; excerpted as described above.
i	Industrial based RBC; calculated as described in the text in accordance with the document referenced above.
-	The table above was established using breathing zone and ground level sample data only.
d	RBC derived using a provisional reference dose, obtained from Kevin Koporec, USEPA ECAO.

Table 20

Chemicals Detected In Phase II Ambient Air Samples, Inside Building NS84

Comparison to Screening Concentrations

CNC FFI (IAQ)

Charleston, South Carolina

Chemical	Frequency of Detection (1)	Default Concentration (ug/m3) (2)	Range of Detected Concentrations (ug/m3)			RBCr (ug/m3)	RBCi (ug/m3)	Notes
1,1,1-Trichloroethane	3 / 6		1.58	-	2.46	100	438	4 5
1,2-Dichlorotetrafluoroethane	1 / 6		1.47	-	1.47	NA	NA	
Chloromethane	3 / 6		0.56	-	0.7	0.99	6.81	3 4 5
Dichlorodifluoromethane	6 / 6		1.29	-	1.88	21	87.5	3 4 5
Styrene	1 / 6		3.66	-	3.66	100	438	4 5
Toluene	5 / 6		0.98	-	1.81	42	175	3 4 5
Trichlorofluoromethane	4 / 6		1.74	-	2.92	73	307	3 4 5
m+p-Xylenes	4 / 6		0.87	-	2.65	73	3066	4 5

NOTES:

* Based on the comparison to residential screening concentrations and the potential for an external source (i.e., a source other than internal building operations) this chemical is a COPC, and it will be carried through the formal BRA process.

1 Frequency of detection indicates the number detected over the number analyzed

2 Default concentration indicates the lesser of one-half the lowest detected concentration and one-half the lowest detection limit; used to calculate the mean of the natural log transformed data for applicable COPC (if applicable)

3 This chemical was detected in sub-slab samples; risk will not be quantified for chemicals not detected in sub-slab samples as the corresponding sub-slab data for this building did not identify the presence of a potential external source.

4 The maximum concentration detected does not exceed the residential screening value.

5 The maximum concentration detected does not exceed the industrial screening value.

NA Not available

RBC USEPA Region III Risk based screening concentration for ambient air, March 1994 version; based on target risk of 1E-6 and target hazard quotient of 0.1.

r Residential Based RBC; excerpted as described above.

i Industrial based RBC; calculated as described in the text in accordance with the document referenced above.

\- The table above was established using breathing zone and ground level sample data only.

Table 21
Chemicals Detected In Phase II Ambient Air Samples, Inside Building 202
Comparison to Screening Concentrations
CNC FFI (IAQ)
Charleston, South Carolina

Chemical	Frequency of Detection (1)	Default Concentration (ug/m3) (2)	Range of Detected Concentrations (ug/m3)			RBCr (ug/m3)	RBCi (ug/m3)	Notes
1,2-Dichloroethane	1 / 6		1.17	-	1.17	0.069	0.47	
Dichlorodifluoromethane	3 / 6		7.9	-	17	21	88	4 5
Tetrachloroethene	2 / 6		1.42	-	1.49	3.1	21	3 4 5
Trichlorofluoromethane	2 / 6		34	-	57	73	307	4 5
Trichlorotrifluoroethane (Freon 113)	4 / 6		2.38	-	6.3	3100	13337	3 4 5

NOTES:

* Based on the comparison to residential screening concentrations and the potential for an external source (i.e., a source other than internal building operations) this chemical is a COPC, and it will be carried through the formal BRA process.

1 Frequency of detection indicates the number detected over the number analyzed

2 Default concentration indicates the lesser of one-half the lowest detected concentration and one-half the lowest detection limit; used to calculate the mean of the natural log transformed data for applicable COPC (if applicable)

3 This chemical was detected in sub-slab samples; risk will not be quantified for chemicals not detected in sub-slab samples as the corresponding sub-slab data for this building did not identify the presence of a potential external source.

4 The maximum concentration detected does not exceed the residential screening value.

5 The maximum concentration detected does not exceed the industrial screening value.

NA Not available

RBC USEPA Region III Risk based screening concentration for ambient air, March 1994 version; based on target risk of 1E-6 and target hazard quotient of 0.1.

r Residential Based RBC; excerpted as described above.

i Industrial based RBC; calculated as described in the text in accordance with the document referenced above.

\- The table above was established using breathing zone and ground level sample data only.

Table 22

Chemicals Detected In Phase II Ambient Air Samples, Inside Building 643

Comparison to Screening Concentrations

CNC FFI (IAQ)

Charleston, South Carolina

	Chemical	Frequency of Detection (1)	Default Concentration (ug/m3) (2)	Range of Detected Concentrations (ug/m3)			RBCr (ug/m3)	RBCi (ug/m3)	Notes
	1,1,1-Trichloroethane	6 / 6		8.24	-	16.6	100	438	3 4 5
	1,2,4-Trichlorobenzene	1 / 6		2.60	-	2.60	21	88.00	4 5
*	Benzene, 1,2,4-trimethyl	5 / 6	0.50	1.00	-	1.80	0.18	0.77	3
	Benzyl chloride	1 / 6		2.75	-	2.75	0.037	0.25	
*	Chloromethane	6 / 6	0.35	0.70	-	1.14	0.99	6.81	3 5
*	Dichlorodifluoromethane	6 / 6	2.47	12.3	-	24.2	21	87.5	3 5
	Styrene	1 / 6		22	-	22	100	438	4 5
	Toluene	6 / 6		1.47	-	2	42	175	3 4 5
*	Trichlorofluoromethane	6 / 6	2.81	21.2	-	84.8	73	307	3 5
	m+p-Xylenes	2 / 6		1.00	-	1.09	73	3066	3 4 5
	p-Ethyltoluene	4 / 6	0.50	1.00	-	1.30	NA	NA	3

NOTES:

* Based on the comparison to residential screening concentrations and the potential for an external source (i.e., a source other than internal building operations) this chemical is a COPC, and it will be carried through the formal BRA process.

1 Frequency of detection indicates the number detected over the number analyzed

2 Default concentration indicates the lesser of one-half the lowest detected concentration and one-half the lowest detection limit; used to calculate the mean of the natural log transformed data for applicable COPC (if applicable)

3 This chemical was detected in sub-slab samples; risk will not be quantified for chemicals not detected in sub-slab samples as the corresponding sub-slab data for this building did not identify the presence of a potential external source.

4 The maximum concentration detected does not exceed the residential screening value.

Table 22
Chemicals Detected In Phase II Ambient Air Samples, Inside Building 643
Comparison to Screening Concentrations
CNC FFI (IAQ)
Charleston, South Carolina

5	The maximum concentration detected does not exceed the industrial screening value.
NA	Not available
RBC	USEPA Region III Risk based screening concentration for ambient air, March 1994 version; based on target risk of 1E-6 and target hazard quotient of 0.1.
r	Residential Based RBC; excerpted as described above.
i	Industrial based RBC; calculated as described in the text in accordance with the document referenced above.
-	The table above was established using breathing zone and ground level sample data only.

Table 23

Chemicals Detected In Phase II Ambient Air Samples, Inside Building 644

Comparison to Screening Concentrations

CNC FFI (IAQ)

Charleston, South Carolina

Chemical	Frequency of Detection (1)	Default Concentration (ug/m3) (2)	Range of Detected Concentrations (ug/m3)	RBCr (ug/m3)	RBCi (ug/m3)	Notes
1,1,1-Trichloroethane	1 / 6		1.86 - 1.86	100	438	4 5
1,2,4-Trichlorobenzene	1 / 6		2.52 - 2.52	21	88	4 5
* Benzene, 1,2,4-trimethyl	6 / 6	1.10	2.20 - 48.9	0.18	0.77	3
Benzene, 1,3,5-trimethyl-	3 / 6		8.9 - 14.5	0.15	0.61	
Benzyl chloride	1 / 6		2.23 - 2.23	0.037	0.25	
* Chloromethane	3 / 6	0.72	1.45 - 2.09	0.99	6.81	3 5
Dichlorodifluoromethane	6 / 6		1.58 - 4.99	21	87.5	3 4 5
Ethylbenzene	3 / 6		1.00 - 1.39	100	438	4 5
Hexachlorobutadiene	1 / 6		4.27 - 4.27	0.073	0.31	
Toluene	4 / 6		0.94 - 6.56	42	175	3 4 5
* Trichlorofluoromethane	6 / 6	2.81	8.93 - 115	73	307	3 5
m+p-Xylenes	3 / 6		4.65 - 5.91	73	3066	4 5
o-Xylene	3 / 6		3.43 - 4.13	73	307	4 5
p-Ethyltoluene	6 / 6	0.90	1.80 - 42.2	NA	NA	3

NOTES:

* Based on the comparison to residential screening concentrations and the potential for an external source (i.e., a source other than internal building operations) this chemical is a COPC, and it will be carried through the formal BRA process.

1 Frequency of detection indicates the number detected over the number analyzed

2 Default concentration indicates the lesser of one-half the lowest detected concentration and one-half the lowest detection limit; used to calculate the mean of the natural log transformed data for applicable COPC (if applicable)

Table 23
Chemicals Detected In Phase II Ambient Air Samples, Inside Building 644
Comparison to Screening Concentrations
CNC FFI (IAQ)
Charleston, South Carolina

3	This chemical was detected in sub-slab samples; risk will not be quantified for chemicals not detected in sub-slab samples as the corresponding sub-slab data for this building did not identify the presence of a potential external source.
4	The maximum concentration detected does not exceed the residential screening value.
5	The maximum concentration detected does not exceed the industrial screening value.
NA	Not available
RBC	USEPA Region III Risk based screening concentration for ambient air, March 1994 version; based on target risk of 1E-6 and target hazard quotient of 0.1.
r	Residential Based RBC; excerpted as described above.
i	Industrial based RBC; calculated as described in the text in accordance with the document referenced above.
-	The table above was established using breathing zone and ground level sample data only.

Table 24

Chemicals Detected In Phase II Ambient Air Samples, Inside Building 645

Comparison to Screening Concentrations

CNC FFI (IAQ)

Charleston, South Carolina

Chemical	Frequency of Detection (1)	Default Concentration (ug/m3) (2)	Range of Detected Concentrations (ug/m3)			RBCr (ug/m3)	RBCi (ug/m3)	Notes
Styrene	1 / 6		95	-	95	100	438	3 4 5
Tetrachloroethene	1 / 6		1.36	-	1.36	3.1	21.1	4 5

NOTES:

- * Based on the comparison to residential screening concentrations and the potential for an external source (i.e., a source other than internal building operations) this chemical is a COPC, and it will be carried through the formal BRA process.
- 1 Frequency of detection indicates the number detected over the number analyzed
- 2 Default concentration indicates the lesser of one-half the lowest detected concentration and one-half the lowest detection limit; used to calculate the mean of the natural log transformed data for applicable COPC (if applicable)
- 3 This chemical was detected in sub-slab samples; risk will not be quantified for chemicals not detected in sub-slab samples as the corresponding sub-slab data for this building did not identify the presence of a potential external source.
- 4 The maximum concentration detected does not exceed the residential screening value.
- 5 The maximum concentration detected does not exceed the industrial screening value.
- NA Not available
- RBC USEPA Region III Risk based screening concentration for ambient air, March 1994 version; based on target risk of 1E-6 and target hazard quotient of 0.1.
- r Residential Based RBC; excerpted as described above.
- i Industrial based RBC; calculated as described in the text in accordance with the document referenced above.
- \- The table above was established using breathing zone and ground level sample data only.

Table 25

Chemicals Detected In Phase II Ambient Air Samples, Inside Building 656

Comparison to Screening Concentrations

CNC FFI (IAQ)

Charleston, South Carolina

Chemical	Frequency of Detection (1)	Default Concentration (ug/m3) (2)	Range of Detected Concentrations (ug/m3)	RBCr (ug/m3)	RBCi (ug/m3)	Notes
1,1,1-Trichloroethane	10 / 12		1.20 - 2.84	100	438	3 4 5
1,2,4-Trichlorobenzene	1 / 12		1.71 - 1.71	21	88	4 5
1,4-Dichlorobenzene	6 / 12		1.44 - 3.13	0.26	1.79	
* Benzene	6 / 12	0.4	0.8 - 1.15	0.22	1.47	3 5
Benzene, 1,2,4-trimethyl	8 / 12		1.60 - 3.20	0.18	0.77	
Benzene, 1,3,5-trimethyl-	4 / 12		1.00 - 1.30	0.15	0.61	
* Chloromethane	10 / 12	0.22	0.43 - 1.07	0.99	6.81	3 5
Dichlorodifluoromethane	12 / 12		1.73 - 10.2	21	87.5	3 4 5
Ethylbenzene	3 / 12		0.96 - 1.43	100	438	4 5
* Methylene chloride	11 / 12	0.45	0.9 - 13.5	3.8	26.2	3 5
Styrene	8 / 12		4 - 16.9	100	438	4 5
Tetrachloroethene	9 / 12		1.36 - 10.5	3.1	21.1	5
Toluene	12 / 12		1.28 - 22.4	42	175	3 4 5
Trichloroethene	2 / 12		1.29 - 1.34	1	7.15	5
Trichlorofluoromethane	12 / 12		2.08 - 7.13	73	307	3 4 5
Trichlorotrifluoroethane (Freon 113)	1 / 12		3.83 - 3.83	3100	13337	4 5
m+p-Xylenes	9 / 12		0.96 - 5.95	73	3066	4 5
p-Ethyltoluene	8 / 12		1.50 - 2.70	NA	NA	

NOTES:

* Based on the comparison to residential screening concentrations and the potential for an external source (i.e., a source

Table 25

Chemicals Detected In Phase II Ambient Air Samples, Inside Building 656

Comparison to Screening Concentrations

CNC FFI (IAQ)

Charleston, South Carolina

other than internal building operations) this chemical is a COPC, and it will be carried through the formal BRA process.

1	Frequency of detection indicates the number detected over the number analyzed
2	Default concentration indicates the lesser of one-half the lowest detected concentration and one-half the lowest detection limit; used to calculate the mean of the natural log transformed data for applicable COPC (if applicable)
3	This chemical was detected in sub-slab samples; risk will not be quantified for chemicals not detected in sub-slab samples as the corresponding sub-slab data for this building did not identify the presence of a potential external source.
4	The maximum concentration detected does not exceed the residential screening value.
5	The maximum concentration detected does not exceed the industrial screening value.
NA	Not available
RBC	USEPA Region III Risk based screening concentration for ambient air, March 1994 version; based on target risk of 1E-6 and target hazard quotient of 0.1.
r	Residential Based RBC; excerpted as described above.
i	Industrial based RBC; calculated as described in the text in accordance with the document referenced above.
-	The table above was established using breathing zone and ground level sample data only.

Table 26

Chemicals Detected In Phase II Ambient Air Samples, Inside Building 657

Comparison to Screening Concentrations

CNC FFI (IAQ)

Charleston, South Carolina

Chemical	Frequency of Detection (1)	Default Concentration (ug/m3) (2)	Range of Detected Concentrations (ug/m3)			RBCr (ug/m3)	RBCi (ug/m3)	Notes
1,2,4-Trichlorobenzene	1 / 6		1.63	-	1.63	21	88	4 5
* 1,4-Dichlorobenzene	5 / 6	1.32	2.65	-	135	0.26	1.79	3
Benzene, 1,2,4-trimethyl	1 / 6		1.10	-	1.10	0.18	0.77	
Chloroform	1 / 6		1.12	-	1.12	0.078	0.53	
Chloromethane	2 / 6		0.43	-	0.56	0.99	6.81	4 5
Dichlorodifluoromethane	6 / 6		1.34	-	5.29	21	87.5	3 4 5
Styrene	2 / 6		1.87	-	4.26	100	438	4 5
Toluene	4 / 6		0.98	-	1.81	42	175	3 4 5
Trichlorofluoromethane	6 / 6		1.57	-	70.8	73	307	3 4 5
m+p-Xylenes	2 / 6		1.13	-	1.87	73	307	3 4 5

NOTES:

* Based on the comparison to residential screening concentrations and the potential for an external source (i.e., a source other than internal building operations) this chemical is a COPC, and it will be carried through the formal BRA process.

1 Frequency of detection indicates the number detected over the number analyzed

2 Default concentration indicates the lesser of one-half the lowest detected concentration and one-half the lowest detection limit; used to calculate the mean of the natural log transformed data for applicable COPC (if applicable)

3 This chemical was detected in sub-slab samples; risk will not be quantified for chemicals not detected in sub-slab samples as the corresponding sub-slab data for this building did not identify the presence of a potential external source.

4 The maximum concentration detected does not exceed the residential screening value.

5 The maximum concentration detected does not exceed the industrial screening value.

Table 26

Chemicals Detected In Phase II Ambient Air Samples, Inside Building 657

Comparison to Screening Concentrations

CNC FFI (IAQ)

Charleston, South Carolina

NA	Not available
RBC	USEPA Region III Risk based screening concentration for ambient air, March 1994 version; based on target risk of 1E-6 and target hazard quotient of 0.1.
r	Residential Based RBC; excerpted as described above.
i	Industrial based RBC; calculated as described in the text in accordance with the document referenced above.
-	The table above was established using breathing zone and ground level sample data only.

5.2.2 COPCs Identified in Building NS84

No interior BZ or GL sample was found to contain any compounds detected in corresponding sub-slab samples at concentrations in excess of the either ambient air RBC at Building NS84. As a result, no COPCs have been identified for Building NS84.

No compound without an identified external source was found to exceed the residential or occupational ambient air RBC at Building NS84. No risk-based screening value was available for 1,2-dichlorotetrafluoroethane. Comparison to the RBCs for structurally similar trichlorotrifluoroethane (residential RBC = 3,100 $\mu g/m^3$) indicates, however, that the levels of 1,2-dichlorotetrafluoroethane detected in Building NS84 (maximum = 1.47 $\mu g/m^3$) should not pose a significant risk to building occupants.

5.2.3 COPCs Identified in Building 202

No interior BZ or GL sample was found to contain any compounds detected in corresponding sub-slab samples at concentrations in excess of the either ambient air RBC at Building 202. As a result, no COPCs have been identified for Building 202.

1,2-Dichloroethane was detected in one sample at a concentration in excess of the residential and occupational ambient air RBC at Building 202. This compound was not, however, detected in any associated sub-slab sample.

5.2.4 COPCs Identified in Building 643

Of the compounds detected in corresponding sub-slab samples, only 1,2,4-trimethylbenzene was detected in BZ and GL samples above the occupational RBC. Four compounds (1,2,4-trimethylbenzene, chloromethane, dichlorodifluoromethane, and trichlorofluoromethane) detected in sub-slab samples at Building 643 were also detected in BZ and GL samples above the residential RBC. As a result, 1,2,4-trimethylbenzene, chloromethane, dichlorodifluoromethane, and trichlorofluoromethane were identified as COPCs for Building 643. No ambient air screening value was available for para-ethyltoluene which was detected in BZ, GL and sub-slab samples at Building 643. Comparison to the RBC for structurally similar para-xylene (residential RBC = 730 $\mu g/m^3$) indicates, however, that the concentrations of para-ethyltoluene detected in Building 643 (maximum = 1.3 $\mu g/m^3$) should not pose a significant risk to building occupants.

Two compounds without a potential sub-slab source were detected at concentrations exceeding the residential RBCs in BZ and GL samples. These compounds were 1,2,4-trichlorobenzene and benzyl chloride, and each was detected in only one of three samples collected. The maximum benzyl chloride concentration also exceeded the occupational RBC.

5.2.5 COPCs Identified in Building 644

Of the compounds detected in corresponding sub-slab samples, only 1,2,4-trimethylbenzene was detected in BZ and GL samples above the occupational RBC. Three compounds (1,2,4-trimethylbenzene, chloromethane, trichlorofluoromethane) detected in sub-slab samples at Building 644, were also detected in BZ and GL samples above the residential RBC. As a result, 1,2,4-trimethylbenzene, chloromethane, and trichlorofluoromethane were identified as COPCs for Building 644. No ambient air screening value was available for para-ethyltoluene which was detected in BZ, GL and sub-slab samples at Building 644. Comparison to the RBC for structurally similar para-xylene (residential RBC = 730 $\mu g/m^3$) indicates, however, that the concentrations of para-ethyltoluene detected in Building 644 (maximum = 42.2 $\mu g/m^3$) should not pose a significant risk to building occupants.

Three compounds without a potential sub-slab source were detected at concentrations in excess of the occupational RBCs in BZ and GL samples. These compounds were 1,3,5-trimethylbenzene, benzyl chloride and hexachlorobutadiene. One compound (1,2,4-trichlorobenzene) exceeded its corresponding residential RBC only, but no external source was identified.

5.2.6 COPCs Identified in Building 645

No interior BZ or GL sample was found to contain any compound detected in corresponding sub-slab samples at concentrations in excess of either ambient air RBC at Building 645. As a result, no COPCs have been identified for Building 645.

Neither of the two detected compounds (styrene and tetrachloroethene) in BZ and GL samples without a potential external source exceeded ambient air RBC.

5.2.7 COPCs Identified in Building 656

None of the compounds with a potential external source detected in Building 656 BZ and GL samples was found to exceed corresponding occupational RBCs. Of the compounds detected in corresponding sub-slab samples, benzene, chloromethane and methylene chloride were the only detected in BZ and GL samples above the residential RBC. As a result, benzene, chloromethane, and methylene chloride were identified as COPCs for Building 656. No ambient air screening value was available for para-ethyltoluene which was detected in BZ, GL and sub-slab samples at Building 656. Comparison to the RBC for structurally similar para-xylene (residential RBC = 730 $\mu g/m^3$) indicates, however, that the levels of para-ethyltoluene detected in Building 656 (maximum = 2.7 $\mu g/m^3$) should not pose a significant risk to building occupants.

Three compounds without a potential sub-slab source were detected at concentrations in excess of the occupational RBCs in BZ and GL samples. These compounds were 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, and 1,4-dichlorobenzene. Three compounds detected in BZ and GL samples (1,2,4-trichlorobenzene, tetrachloroethene and trichloroethane) exceeded their respective residential RBC only, but no external source was identified for any compounds.

5.2.8 COPCs Identified in Building 657

Of the compounds detected in corresponding sub-slab samples, only 1,4-dichlorobenzene was detected in BZ and GL samples above the residential and occupational RBCs. No other compounds detected in sub-slab samples at Building 657 were also detected in BZ and GL samples above the residential RBC. As a result, 1,4-dichlorobenzene was the sole COPC identified for Building 657.

Two compounds without a potential sub-slab source were detected at concentrations in excess of the residential and occupational RBCs in BZ and GL samples collected in Building 657. These compounds were 1,2,4-trimethylbenzene and chloroform. One compound (1,2,4-trichlorobenzene) exceeded its corresponding residential RBC only, but no external source was identified.

5.2.9 Summary of COPCs Identified in All Buildings

Table 27 summarizes COPCs identified in each building surveyed during the FFI. As shown in Table 27, no COPCs were identified in Buildings NS84, 202 or 645. As a result, these buildings will not be addressed in the formal risk assessment process.

Table 27
Chemicals of Potential Concern Identified
In Breathing Zone and Ground Level Samples
Charleston, South Carolina

	Building							
COPC	36	NS84	202	643	644	645	656	657
Benzene	X						X	
Chloroform	X							
Chloromethane	X			X	X		X	
1,4-Dichlorobenzene	X							X
1,2,4-Trimethylbenzene				X	X			

Table 27
Chemicals of Potential Concern Identified
In Breathing Zone and Ground Level Samples
Charleston, South Carolina

COPC	Building							
	36	NS84	202	643	644	645	656	657
Dichlorodifluoromethane				X				
Trichlorofluoromethane				X	X			
Methylene chloride							X	

Note:
'X' Indicates the compound was identified as a COPC in the building shown.

5.3 Exposure Assessment

The purpose of this section of the baseline risk assessment is to determine the magnitude of contact that a potential receptor may have with site-related COPCs in indoor air. Exposure assessment involves four stages:

- Characterization of building settings and building uses by the occupants.
- Identification of COPC release and migration pathways.
- Identification of the potential receptors, under various building uses or conditions.
- Quantification of intakes of COPCs.

5.3.1 Characterization of Exposure Setting

In and around the FFI study area, several SWMUs and AOCs are currently the subject of RFAs and RFIs. The study area is located within Zone H, as defined in the RCRA RFI Work Plan. Persons working in the buildings under investigation could be exposed to levels of airborne toxic chemicals that could adversely affect their health in the form of toxic effects and/or increased risk of cancer.

5.3.1.1 Physical Setting

The State Department Buildings and others addressed in the FFI were formerly used by the Navy as the Fleet and Mine Warfare Training Center. The buildings are in Zone H, which is in the southern portion of the peninsula formed by Shipyard Creek and the Cooper River. Within Zone H are several SWMUs and AOCs which are the subject of ongoing RFIs. Each building studied during the FFI are described in Section 3.2.3 and Appendix A.

5.3.1.2 Potentially Exposed Populations

Currently the potentially exposed population can be characterized as those persons engaged in office, training, recreational, or retail sales activities. The exception is Building 36 which serves as a barracks. Each potentially exposed population is typically present in an individual study area (building) for less than 12 hours a day.

Potential future exposed populations may include infants and young children or senior citizens based upon proposed Base reuse plans. Some buildings may be used as a day care facility. Another reuse alternative being considered is a senior citizen center. Based on these projected future uses, both groups could be exposed to airborne COPCs. Due to the uncertainty regarding the ultimate use of buildings in the FFI study area, each building was considered to have equal potential for use as a day care or senior citizen center. This assumption was made in spite of the fact that most buildings studied are not well suited for these uses.

5.3.1.3 Identification of Exposure Pathways

The only potential exposure pathway addressed in this limited scope risk assessment is indoor air inhalation. The assessment was restricted to this pathway as the FFI sampling plan was designed exclusively to assess airborne contamination. The baseline risk assessment accompanying the Zone H RFI report will address all viable exposure pathways in the FFI study area including those applicable to ecological receptors (if necessary).

For current scenarios, inhalation of indoor air pathways were evaluated for a standard adult worker over a typical eight-hour work day. Exposure under future Site usage scenarios was evaluated relative to potential site residents and day-care center attendees (children ages 1 to 5 years). Future site resident estimates exposures may also apply to current Building 36 residents although the fraction of the day spent in the barracks has been estimated to be similar to that of adult workers. Any remedial alternatives necessary for protection of day care attendees will also be protective of senior citizens based on standard exposure assumptions. As a result, exposures were not predicted for senior citizen receptors.

5.3.2 Exposure Point Concentrations

The exposure point concentration (EPC) is the concentration of a contaminant in an exposure medium that will be contacted by a real or hypothetical receptor. Determination of EPC depends on factors such as:

- Availability of data
- Amount of data available to perform statistical analysis
- Background concentrations not attributed to site impacts
- Location of the potential receptor

USEPA, Region IV guidance calls for the assumption of lognormal distributions for environmental data and the calculation of 95 percent upper confidence limit of the mean for use in exposure quantification. Due to the limited number of air samples (<10) collected in each building during the Phase II IAQ surveys, no UCL values were computed for air COPCs.

To arrive at the EPC, the three-day mean concentration of COPCs in each building were calculated for breathing zone and ground level samples. For example, a sample was collected in the BZ location on each of the days. The mean for the BZ was compared to the means calculated for other sample locations (i.e., the mean for GL). The maximum three-day mean concentration was used to predict potential exposure through the inhalation pathway. For conservatism, it was assumed that breathing zone and ground level air had the same potential for inhalation. Tables 28 through 32 show the EPC determination process for each building in which COPCs were identified.

Analytical results are presented as "nondetects" whenever chemical concentrations in samples do not exceed the detection or quantitation limits for the analytical procedures. Generally, the detection limit is the lowest concentration of a chemical that can be quantified above the normal, random noise of an analytical instrument or method. To apply the above-mentioned statistical procedures to a data set with reported "nondetects," it was assumed that the chemical was present at a default concentration. One-half of the lowest sample quantitation limit and one-half the lowest reported hit for the specific medium were compared, and the lesser of the two values was used as the default concentration. This default concentration was inserted for all reported "nondetects" prior to calculation of three day mean concentrations.

5.3.3 Quantification of Exposure

This section describes the models, equations, and input parameter values used to quantify doses or intakes of the COPCs through the inhalation pathway. The models are designed to estimate route-and-medium-specific factors, which are multiplied by the exposure point concentration to estimate chronic daily dose. The intake model variables generally reflect 50th or 95th percentile values, which ensure that the estimated intakes represent the reasonable maximum exposure (RME) when applied to the exposure point concentrations. Formulae were derived from RAGS, Part A unless otherwise indicated. Table 33 lists input parameters used to compute chronic daily intakes (CDI) for the current and potential future receptors.

Table 28
COPCs In Phase II Ambient Air Samples, Inside Building 36
Exposure Point Concentrations
CNC FFI (IAQ)
Charleston, South Carolina

Chemical	BZ Mean	GL Mean	EPC	Type
Benzene	0.2	NA	0.2	BZ
Chloroform	NA	1.7	1.7	GL
Chloromethane	0.8	0.6	0.8	BZ
1,4-Dichlorobenzene	21	154	154	GL

NOTES:

NA not applicable
BZ breathing zone sample
GL ground level sample
\- one-half of the detection limit or one-half the lowest detected hit (whichever was lower) was used as the default concentration for chemicals not detected in each of the samples collected in either the BZ or GL samples; this concentration was inserted in accordance with USEPA recommendations on data management.
EPC indicates exposure point concentration.
Type indicates the mean concentration reported in either the BZ or GL used as EPC.

Table 29

COPCs In Phase II Ambient Air Samples, Inside Building 643

Exposure Point Concentrations

CNC FFI (IAQ)

Charleston, South Carolina

Chemical	BZ Mean	GL Mean	EPC	Type
Benzene, 1,2,4-trimethyl	1.41	1.00	1.41	BZ
Chloromethane	0.9	0.81	0.9	BZ
Dichlorodifluoromethane	20.3	18.8	20.3	BZ
Trichlorofluoromethane	51.4	48.1	51.4	BZ

NOTES:

- NA not applicable
- BZ breathing zone sample
- GL ground level sample
- \- one-half of the detection limit or one-half the lowest detected hit (whichever was lower) was used as the default concentration for chemicals not detected in each of the samples collected in either the BZ or GL samples; this concentration was inserted in accordance with USEPA recommendations on data management.
- EPC indicates exposure point concentration.
- Type indicates the mean concentration reported in either the BZ or GL used as EPC.

Table 30
COPCs In Phase II Ambient Air Samples, Inside Building 644
Exposure Point Concentrations
CNC FFI (IAQ)
Charleston, South Carolina

Chemical	BZ Mean	GL Mean	EPC	Type
Benzene, 1,2,4-trimethyl	37.3	4.84	37.3	BZ
Chloromethane	1.68	NA	1.68	BZ
Trichlorofluoromethane	95.7	9.61	95.7	BZ

NOTES:

NA not applicable
BZ breathing zone sample
GL ground level sample
- one-half of the detection limit or one-half the lowest detected hit (whichever was lower) was used as the default concentration for chemicals not detected in each of the samples collected in either the BZ or GL samples; this concentration was inserted in accordance with USEPA recommendations on data management.
EPC indicates exposure point concentration.
Type indicates the mean concentration reported in either the BZ or GL used as EPC.

able 31
OPCs In Phase II Ambient Air Samples, Inside Building 656
xposure Point Concentrations
NC FFI (IAQ)
harleston, South Carolina

hemical	BZ Mean	GL Mean	EPC	Type
enzene	0.88	0.81	0.88	BZ
hloromethane	0.87	0.86	0.87	BZ
ethylene chloride	5.67	2.28	5.67	BZ

NOTES:

NA not applicable

BZ breathing zone sample

GL ground level sample

\- one-half of the detection limit or one-half the lowest detected hit (whichever was lower) was used as the default concentration for chemicals not detected in each of the samples collected in either the BZ or GL samples; this concentration was inserted in accordance with USEPA recommendations on data management.

EPC indicates exposure point concentration.

Type indicates the mean concentration reported in either the BZ or GL used as EPC.

Table 32
COPCs In Phase II Ambient Air Samples, Inside Building 657
Exposure Point Concentrations
CNC FFI (IAQ)
Charleston, South Carolina

Chemical	BZ Mean	GL Mean	EPC	Type
1,4-Dichlorobenzene	109	2.75	109	BZ

NOTES:

NA not applicable
BZ breathing zone sample
GL ground level sample
- one-half of the detection limit or one-half the lowest detected hit (whichever was lower) was used as the default concentration for chemicals not detected in each of the samples collected in either the BZ or GL samples; this concentration was inserted in accordance with USEPA recommendations on data management.
EPC indicates exposure point concentration.
Type indicates the mean concentration reported in either the BZ or GL used as EPC.

Table 33
Exposure Assumptions for Inhalation Pathway
Current and Future Receptors

Pathway Parameter	Current Land Use	Future Land Use		
	Adult Worker[a]	Resident Child	Resident Adult	Day Care Child (age 1-5)
Inhalation Rate (m^3/day)	6.7[b]	12[b]	20[b]	6[b]
Exposure Frequency (days/year)	250[c]	350[c]	350[c]	250[c]
Exposure Duration (years)	25[d]	6[d]	24[d]	5[d]
Body Weight (kg)	70[d]	15[cd]	70[d]	15[d]
Averaging $Time_{carc}$	25550[e]	25550[e]	25550[e]	25550[e]
Averaging $Time_{noncarc}$	9,125[e]	2,190[e]	8,760[e]	1,825[e]

Notes:

a Adult worker indicates those individuals exposed while performing duties associated with their occupation. Due to the exposure frequency, fraction inhalation rate, and exposure duration assumed for this receptor group, remedial goals established for adult workers will also be protective of recreational and/or part-time building occupants.

b. Adult worker inhalation rate is set equal to 20 m^3/day times the fraction of the day spent in the subject building (8 hour work shift/24 hour day). Inhalation rates used for adult and child residents and day care attendees are standard default values.

c. Adult worker exposure frequency assumes 50 5 day work weeks per year. Residential receptor exposure frequency assumes one two week vacation over the course of a year. Day care attendee exposure frequency was based on 5 class days/week for 50 weeks.

d. *Derived from: Risk Assessment Guidance for Superfund, Volume I-Human Health Evaluation Manual, Part A,* EPA/OERR, EPA/540/1-89/002, December 1989 (Interim).(RAGS Part A) and *Risk Assessment Guidance for Superfund, Volume I-Human Health Evaluation Manual, Supplemental Guidance-Standard Default Exposure Factors-Interim Final,* EPA/OERR, OSWER Directive: 9285.6-03, March 25, 1991. (RAGS Supplement)

e. Averaging $Time_{carc}$ indicates the averaging time used for carcinogenic COPCs and is the calculated product of 70 years (average lifetime) x 365 days/year. Averaging $Time_{noncarc}$ indicates the averaging time used for non-carcinogenic COPCs and is the product of exposure duration x 365 days/year.

Assumptions presented in Table 33 were used to assess chronic exposure for current/future site workers. Subchronic exposure is considered to be that which occurs over a period of two weeks to 7 years. The potential for subchronic exposure and the implications relative to potential human health effects is discussed in Section 5.5.

Age-adjusted ingestion and contact factors were derived for the potential future residential receptors (resident adult and resident child combined) for carcinogenic endpoints. These factors take into account the difference in daily inhalation rates, body weights, and exposure durations for children aged one to six years old and others aged seven to 31 years old. The exposure frequency is assumed to be identical for the two age groups. Because the future use of the buildings investigated during the FFI is unknown, it is not possible to predict with certainty exposure frequencies or durations for future workers. Activities in most buildings have ceased as part of the BRAC process. Therefore, current site worker activities were not considered a valid representation of future use. As a result, standard default assumptions for an occupational scenario were imposed as RME estimators. Potential variability in chronic exposure projections resulting from use of median exposure duration and frequency assumptions is addressed in Section 5.6.5.

Inhalation of Airborne Contaminants

Quantification of chronic daily intake (CDI) of airborne COPCs detected in FFI study area buildings was estimated from the general equation:

$$CDI_{air} = (C_{air})(Inh)(FI)(EF)(ED)(CF)/(BW)(AT)$$

where:

CDI_{air}	=	inhaled dose of COPC (mg/kg-day)
C_{air}	=	concentration of COPC in indoor air ($\mu g/m^3$)
Inh	=	inhalation rate of air (m^3/day)
FI	=	fraction of daily intake from contaminated source (unitless value=1)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
CF	=	conversion factor (10^{-3} mg/μg)

BW	=	body weight (kg)
AT	=	averaging time (days)

A lifetime-weighted average inhalation rate is computed to address carcinogenic COPCs to which future residents may be exposed. The lifetime-weighted average is expressed in units of m^3/year*kg by summing Inh/ED * BW for the child and adult receptor. Tables 34 through 38 provide chronic daily intake estimates for current and potential future receptors on a building-specific basis.

5.4 Toxicity Assessment

5.4.1 Carcinogenicity and Noncancer Effects

The USEPA has established a classification system for rating the potential carcinogenicity of environmental contaminants based on the weight of scientific evidence. The cancer classes are described below. Cancer weight-of-evidence class "A" (human carcinogens) means that human toxicological data have shown a proven correlation between exposure and the onset of cancer (in varying forms). The "B1" classification indicates some human exposure studies have implicated the compound as a probable carcinogen. Weight-of-evidence class "B2" indicates a possible human carcinogen, which is a classification based on positive laboratory animal data (for carcinogenicity) in the absence of human data. Weight-of-evidence class "C" identifies possible human carcinogens, and class "D" indicates a compound not classifiable with respect to its carcinogenic potential. The USEPA has established slope factors (SF) for carcinogenic compounds. The SF is defined as a "plausible upper-bound estimate of the probability of a response (cancer) per unit intake of a chemical over a lifetime".

In addition to potential carcinogenic effects, most substances can also produce systemic toxic responses at doses greater than experimentally derived threshold levels. The USEPA has derived Reference Dose (RfD) values for these substances. A chronic RfD is defined as "an estimate (with uncertainty spanning perhaps an order of magnitude or greater) of a daily exposure level

able 34
hronic Daily Intake for COPCs
ased on Occupational, Residential, and Childhood Exposure
NC FFI (IAQ) Building 36
harleston, South Carolina

		CDI (mg/kg-day)					
		Current Use-chronic		Potential Future Use			
hemical	EPC (ug/m3)	occ - nc	occ - c	res - nc	res - c	chi - nc	chi - c
enzene	0.224	1.46E-05	5.21E-06	1.72E-04	3.57E-05	6.37E-05	4.55E-06
hloroform	1.72	1.12E-04	4.00E-05	1.32E-03	2.74E-04	4.89E-04	3.49E-05
hloromethane	0.833	5.43E-05	1.94E-05	6.39E-04	1.33E-04	2.37E-04	1.70E-05
4-Dichlorobenzene	154	1.00E-02	3.58E-03	1.18E-01	2.46E-02	4.38E-02	3.13E-03

NOTES:

CDI indicates chronic daily intake
occ indicates typical occupational exposure assumptions
res indicates typical residential exposure assumptions
chi indicates childhood exposure assumptions assuming the building is used as a Day-Care Center for children age 1-5 yrs, 260 days/yr.
nc indicates noncarcinogen-based exposure assumptions; only childhood exposure was considered for the residential noncarcinogenic exposure pathway
c indicates carcinogen-based exposure assumptions

ıble 35
ıronic Daily Intake for COPCs
ısed on Occupational, Residential, and Childhood Exposure
NC FFI (IAQ) Building 643
ıarleston, South Carolina

		CDI (mg/kg-day)					
		Current Use		**Potential Future Use**			
ıemical	EPC (ug/m3)	occ - nc	occ - c	res - nc	res - c	chi - nc	chi - c
nzene, 1,2,4-trimethyl	1.41	9.20E-05	3.28E-05	1.08E-03	2.25E-04	4.02E-04	2.87E-05
loromethane	0.90	5.88E-05	2.10E-05	6.92E-04	1.44E-04	2.57E-04	1.84E-05
chlorodifluoromethane	20.3	1.32E-03	4.73E-04	1.56E-02	3.24E-03	5.78E-03	4.13E-04
ichlorofluoromethane	51.4	3.35E-03	1.20E-03	3.94E-02	8.20E-03	1.46E-02	1.05E-03

NOTES:

CDI indicates chronic daily intake
occ indicates typical occupational exposure assumptions
res indicates typical residential exposure assumptions
chi indicates childhood exposure assumptions assuming the building is used as a Day-Care Center for children age 1-5 yrs, 260 days/yr.
nc indicates noncarcinogen-based exposure assumptions; only childhood exposure was considered for the residential noncarcinogenic exposure pathway
c indicates carcinogen-based exposure assumptions

able 36
hronic Daily Intake for COPCs
ased on Occupational, Residential, and Childhood Exposure
NC FFI (IAQ) Building 644
harleston, South Carolina

		CDI (mg/kg-day)					
		Current Use		**Potential Future Use**			
	EPC						
hemical	(ug/m3)	occ - nc	occ - c	res - nc	res - c	chi - nc	chi - c
enzene, 1,2,4-trimethyl	37.3	2.43E-03	8.69E-04	2.86E-02	5.96E-03	1.06E-02	7.59E-04
hloromethane	1.68	1.10E-04	3.91E-05	1.29E-03	2.68E-04	4.79E-04	3.42E-05
richlorofluoromethane	95.7	6.24E-03	2.23E-03	7.34E-02	1.53E-02	2.73E-02	1.95E-03

NOTES:

CDI indicates chronic daily intake
occ indicates typical occupational exposure assumptions
res indicates typical residential exposure assumptions
chi indicates childhood exposure assumptions assuming the building is used as a Day-Care Center for children age 1-5 yrs, 260 days/yr.
nc indicates noncarcinogen-based exposure assumptions; only childhood exposure was considered for the residential noncarcinogenic exposure pathway
c indicates carcinogen-based exposure assumptions

able 37
hronic Daily Intake for COPCs
ased on Occupational, Residential, and Childhood Exposure
NC FFI (IAQ) Building 656
harleston, South Carolina

		CDI (mg/kg-day)					
		Current Use		**Potential Future Use**			
hemical	EPC (ug/m3)	occ - nc	occ - c	res - nc	res - c	chi - nc	chi - c
enzene	0.88	5.73E-05	2.05E-05	6.74E-04	1.40E-04	2.50E-04	1.79E-05
hloromethane	0.87	5.66E-05	2.02E-05	6.65E-04	1.39E-04	2.47E-04	1.77E-05
ethylene chloride	5.67	3.70E-04	1.32E-04	4.35E-03	9.06E-04	1.62E-03	1.15E-04

NOTES:

CDI indicates chronic daily intake
occ indicates typical occupational exposure assumptions
res indicates typical residential exposure assumptions
chi indicates childhood exposure assumptions assuming the building is used as a Day-Care Center for children age 1-5 yrs, 260 days/yr.
nc indicates noncarcinogen-based exposure assumptions; only childhood exposure was considered for the residential noncarcinogenic exposure pathway
c indicates carcinogen-based exposure assumptions

able 38

hronic Daily Intake for COPCs

ased on Occupational, Residential, and Childhood Exposure

NC FFI (IAQ) Building 657

harleston, South Carolina

		CDI (mg/kg-day)					
		Current Use		**Potential Future Use**			
hemical	EPC (ug/m3)	occ - nc	occ - c	res - nc	res - c	chi - nc	chi - c
4-Dichlorobenzene	109	7.12E-03	2.54E-03	8.38E-02	1.74E-02	3.11E-02	2.22E-03

NOTES:

CDI indicates chronic daily intake

occ indicates typical occupational exposure assumptions

res indicates typical residential exposure assumptions

chi indicates childhood exposure assumptions assuming the building is used as a Day-Care Center for children age 1-5 yrs, 260 days/yr.

nc indicates noncarcinogen-based exposure assumptions; only childhood exposure was considered for the residential noncarcinogenic exposure pathway

c indicates carcinogen-based exposure assumptions

for the human population, including sensitive subpopulations, that is likely to be without an appreciable risk of deleterious effects during a lifetime." These toxicological values are used in risk formulae to assess the upper-bound level of cancer risk and non-cancer hazard associated with exposure to a given level of contamination.

For carcinogens, the potential risk posed by a chemical is computed by multiplying the CDI (as mg/kg-day) by the SF (in reciprocal mg/kg-day). The hazard quotient (for non-carcinogens) is computed by dividing the CDI by the RfD. The USEPA has set standard limits (or points of departure) for carcinogens and non carcinogens to evaluate whether significant risk is posed by a chemical (or combination of chemicals). For carcinogens, the point-of-departure range is 1E-6 with a generally excepted range of 1E-4 to 1E-6. These risk values correlate with 1 in 10,000 and 1 in 1,000,000 excess cancer incidents resulting from exposure to xenobiotics.

For noncarcinogens, other toxic effects are generally considered possible if the hazard quotient (or sum of hazard quotients for a pathway a.k.a. hazard index) exceeds unity (a value of 1). Although both cancer risk and noncancer hazard are generally additive (within each group) only if the target organ is common to multiple chemicals, a most conservative estimate of each may be obtained by summing the individual risks or hazards regardless of target organ. This baseline risk assessment has taken the universal summation approach for each class of toxicant. Additional details regarding the risk formulae applied to COPCs detected in the FFI study area buildings are provided in Section 5.5.

Table 39 summarizes toxicological data in the form of RfDs and SFs obtained for each COPC identified during the FFI IAQ surveys. Critical studies used in the establishment of toxicity classifications by USEPA are shown in the Integrated Risk Information System (IRIS) database (primary source) and/or Health Effects Assessment Summary Tables (HEAST) Fiscal Year 1994 (secondary source). In addition, the USEPA Region III, Risk-based Concentration Tables, Fourth Quarter 1994 were found to contain toxicological values not listed in primary or secondary sources. Where applicable, these values were also included in the database for this BRA. Threshold limit values (TLVs) have been established by the American Conference of Governmental Industrial Hygienists (ACGIH) for each air COPC detected in the study area. The values were obtained from *1994-1995 Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices,* ACGIH, 1994, and are also included in Table 39. These standards are considered ARARs for airborne contaminants where the sole exposed population is adult workers.

5.4.2 Toxicity Profiles for COPCs

Benzene is a clear, colorless liquid, and is volatile. Benzene is poisonous by intravenous and possibly other routes, and moderately toxic by inhalation, ingestion, subcutaneous, and intraperitoneal routes. This compound is a strong eye and mild skin irritant, and central nervous system and blood system effects by inhalation and ingestion have been reported. Bone marrow effects (Leukemia) have also been linked to benzene exposures. Poisoning occurs most commonly via inhalation of the vapor, though benzene can penetrate the skin and poison in that way. Locally, benzene has a comparatively strong irritating effect, producing erythema and burning, and in more severe cases, edema and even blistering. Benzene is a USEPA Class A carcinogen.

Chloroform, a halogenated hydrocarbon, has been used as a fumigant and an additive used to suppress the fire hazard of carbon disulfide, as well as having a low capacity for insect control. Volatile and gaseous anesthetics such as chloroform are sometimes used to produce general anesthesia. This contaminant is the primary chlorinated hydrocarbon produced during chlorination of drinking water, and is commonly present at low concentrations in most drinking water supplies. This compound depresses all functions of the central nervous system in descending order from the cortex to the medulla. Additional target organs include the liver, heart, and kidney. Chloroform exposure to the heart sensitizes the muscle to arrhythmias, as

Table 39
Toxicity Database Information
CNC FFI (IAQ)
Charleston, South Carolina

Chemical	RfDo (mg/kg-day)	RfDi (mg/kg-day)	UF	Subchronic RfDi (mg/kg-day)	Confidence	Target Organ/ Critical Effect	SFo (mg/kg-day)-1	SFi (ug/m3)	Target Organ/ Critical Effect	TLV (ug/m3)	USEPA Cancer Class
Benzene	NA	0.00171 n	1000	0.0171 n	Low	Hematological toxin	0.029 i	0.029 i	Leukemia	32000	A
Chloroform	0.011 a	0.011 n	1000	0.011 n	Medium	Liver lesions	0.0061 i	0.0805 i	Liver carcinoma	49000	B2
Chloromethane	NA	2.57 n	30	2.57 n	High	Hepatotoxicity	0.013 h	0.0063 h	Kidney tumors	103000	B2
1,4-Dichlorobenzene	NA	0.229 i	100	2.29 +	Medium	Liver weight	0.024 h	NA	Liver tumors	60000	C
1,2,4-Trimethylbenzene	0.0005 n	0.00171 n	3000	0.0171 +	Low	Respiratory,CNS,Spleen	NA	NA	Not Applicable	123000	D
Dichlorodifluoromethane	0.2 i	0.0571 h-	10000	0.571 h	Low	Liver lesions	NA	NA	Not Applicable	4950000	D
Trichlorofluoromethane	0.3 i	0.2 h-	10000	2 h	Low	Whole body/weight	NA	NA	Not Applicable	NA	D
Methylene Chloride	0.06 i	0.857 h	100	0.857 h	Medium	Liver toxicity	0.0075 i	0.00164 i	Liver tumors	174000	B2

NOTES:

- i indicates the parameters above were obtained from the Integrated Risk Information System (IRIS).
- h indicates the parameters above were obtained from the Health Effects Assessment Summary Tables (HEAST).
- h-a indicates the parameters above were obtained from the Health Effects Assessment Summary Tables (HEAST) alternative lists.
- n indicates the parameters above were obtained from National Center for Environmental Assessment Risk Assessment Issue Papers for use as provisional toxicological values; **chloroform and chloroform RfDi's were calculated from their subchronic RfCs.**
- SF indicates slope factor
- RfD indicates reference dose
- o indicates oral
- i indicates inhalation
- TLV time weighted average threshold limit value, as excerpted from the ACGIH TLV Book.
- NA not applicable; no information was available
- \- no TLV was available for trichlorofluoromethane; the short-term exposure limit is 5620000 ug/m3.

do many halogenated hydrocarbons. This action could interfere with digitalis glycosides or a pacemaker in the form of premature or uncontrolled beats. Chloroform is a USEPA B2 carcinogen.

Methylene Chloride, a common industrial solvent, has also been used in the post-harvest fumigation of strawberries and commodity fumigation of grains, with ethylene for degreening citrus fruits. This compound causes central nervous system depression, and lung and liver damage. The potential exists for synergistic hepatotoxic effects during corresponding exposure to enzyme inducers such as alcohols and ketones. Methylene Chloride is a USEPA B2 carcinogen.

Chloromethane is a colorless gas having an ethereal odor and sweet taste. It is slightly soluble in water and volatile. Acute poisoning is characterized by the narcotic effect. In addition, repeated exposure to low concentrations cause damage to the central nervous system and less frequently to the liver, kidneys, bone marrow and cardiovascular system. Hemorrhages into the lungs, intestinal tract and have also been reported. In exposures to high concentration, dizziness, drowsiness, incoordination, confusion, nausea and vomiting, abdominal pains, hiccoughs, diplopia and dimness of vision are followed by delirium, convulsions and coma have been reported and death may be immediate. Death may occur several days later from degenerative changes in the heart, liver and especially the kidneys.

1,4-Dichlorobenzene is commonly found as white crystals, and is used as a moth repellant, general insectide and a fumigant. Exposure may result in mucous membrane, skin, lung, and corneal irritation. Prolonged exposures have also been associated with liver and kidney damage as well as CNS depression. A oral slope factor is available from HEAST but the research NOAEL selected may not apply to inhalation exposures.

1,2,4-Trimethylbenzene- a component of petroleum distillates and solvents used in rubber and plastic cements which is liquid at room temperatures. It is also found in perfumes and dyes. Toxicity is generally greater for inhaled doses compared to the direct ingestion route. Most lower boiling point compounds in petroleum distillates are fat solvent and may alter the function of nerves producing depression, coma and sometimes convulsions. Petroleum distillates can also affect the liver, kidneys and bone marrow although benzene is the primary compound believed to contribute to these effects. The provisional oral RfD determined by USEPA, ECAO is 0.00171, and it is unknown whether the critical study selected as a NOAEL source is applicable to inhalation exposures.

Dichlorodifluoromethane and Trichlorofluoromethane- These chlorofluorocarbons are gases at standard temperature and pressure (boiling points of -29.8°C and 23.7°C.). These compounds are commonly used as refrigerants and aerosol propellants, and non flammable. They decompose to form fluorine, hydrofluoric acid, hydrochloric acid and phosgene when exposed to an open flame. Animal experiments have shown that by usual exposure methods, these compounds are almost nontoxic. The only toxic effect from exposure is anesthesia, which occurs at concentrations of 10 percent or more. Some evidence exists that chlorofluorocarbons sensitize animals to cardiac arrhythmias.

5.5 Risk Characterization

Risk characterization is the combination of the results of the exposure assessment and toxicity assessment to yield qualitative and quantitative expressions of risk for the exposed receptors. The quantitative component is an expression of the probability of developing cancer, or a non-probabalistic comparison of estimated dose with a reference dose for noncancer effects. These quantitative estimates are developed for individual chemicals, exposure pathways, transfer media and source media, and for each receptor for all media to which one may be exposed. The qualitative component usually involves comparison of COPC concentrations in media with established criteria or standards for chemicals for which there are no suitable toxicity values. The risk characterization is used to guide risk management decisions.

Generally, the risk characterization follows the methodology prescribed by RAGS Part A, as modified by more recent information and supplemental guidance cited in the earlier sections of this document. The EPA methods are appropriately designed to be health-protective, and tend to overestimate, rather than underestimate risk. The risk results, however, are generally overly conservative, because risk characterization involves multiplication of the conservatisms built into the exposure and toxicity assessments.

This section characterizes the potential health risks associated with the intake of airborne chemicals detected in the FFI survey building. The methods used to estimate the types and magnitudes of health effects associated with exposure to chemicals.

5.5.1 Risk Characterization Methodology

Potential risks to humans following exposure to COPCs are estimated using methods established by EPA when available. These methods are health-protective and are likely to overestimate, rather than underestimate risk. Risks from hazardous chemicals are calculated for either carcinogenic or noncarcinogenic effects. Some carcinogenic chemicals may also pose a noncarcinogenic hazard. The potential human health effects associated with chemicals which may produce systemic toxic and carcinogenic influences are characterized for both types of health effects.

5.5.2 Carcinogenic Effects of Chemicals

The risk attributed to exposure to carcinogens is estimated as the probability of an individual developing cancer over a lifetime as a result of exposure to a potential carcinogen. In the low-dose range, which would be expected for most environmental exposures, cancer risk is estimated from the following linear equation (RAGS, Part A):

$$ILCR = (CDI)(SF)$$

where:

ILCR = incremental lifetime excess cancer risk, a unitless expression of the probability of developing cancer, adjusted for background incidence

CDI = chronic daily intake, averaged over 70 years (mg/kg-day)

SF = cancer slope factor $(mg/kg\text{-}day)^{-1}$

For a given pathway with simultaneous exposure of a receptor to several carcinogens, the following equation is used to sum cancer risks:

$$Risk_p = ILCR(chem_1) + ILCR(chem_2) + \ldots ILCR(chem_i)$$

where:

$Risk_p$ = total pathway risk of cancer incidence

$ILCR(chem_i)$ = individual chemical cancer risk

Cancer risk for a given receptor across pathways and across media is summed in the same manner.

5.5.3 Noncarcinogenic Effects of Chemicals

The risks associated with the noncarcinogenic effects of chemicals are evaluated by comparing an exposure level or intake with a reference dose. The hazard quotient (HQ), defined as the ratio of intake to RfD is defined as (RAGS, Part A):

$$HQ = CDI/RfD$$

where:

HQ = hazard quotient (unitless)

CDI = intake of chemical (mg/kg-day)

RfD = reference dose (mg/kg-day)

Chemical noncarcinogenic effects are evaluated on a chronic basis, using chronic RFD values. An HQ of unity or 1 indicates that the estimated intake equals the RfD. If the HQ is greater than unity, there may be a concern for potential adverse health effects.

In the case of simultaneous exposure of a receptor to several chemicals, a hazard index (HI) will be calculated as the sum of the HQs by:

$$HI = HQ_1 + HQ_2 + \ldots HQ_i$$

where:

HQ = Hazard Quotient (unitless)

HI = Hazard Index (unitless)

5.5.4 Air Pathway

For each building, the potential carcinogenic risk and non-carcinogenic hazard associated with exposure to each identified COPC was evaluated. These projections are discussed in the following sections on a building-specific basis. Risk and hazard projections for Buildings 36, 643, 644, 656, and 657 were calculated separately. The following receptor groups were evaluated for carcinogenic and non-carcinogenic effects: current adult workers, potential future site residents (child and adult), and potential future day care center attendees. Chemicals of concern (COC) were determined to be those compounds contributing to exposure pathways with computed carcinogenic risk greater than 1E-4 and/or a hazard index greater than 1, and which had individual risk values above 1E-6 and/or a hazard quotient greater than 0.1.

5.5.4.1 Building 36 Risk/Hazard

As shown in Table 40, no COCs were identified for the current adult workers or potential future day care attendee receptors at Building 36. Three COCs were identified based on a cumulative incidental lifetime excess cancer risk (ILCR) of 6E-4 for future site residents. These COCs were benzene, chloroform and 1,4-dichlorobenzene, and had individual ILCRs of 1E-6, 2.2E-5 and 5.9E-4, respectively. The 1,4-dichlorobenzene ILCR was computed using the oral slope factor as a surrogate value for an inhalation slope factor. This application of a surrogate toxicity value lends uncertainty regarding confidence that can be placed in the projected ILCR and any resultant remedial goal options. No COCs were identified based upon potential non-carcinogenic hazard indices. No COPC detected in Building 36 was found to exceed its corresponding TLV.

5.5.4.2 Building 643 Risk/Hazard

As shown in Table 41, no COCs were identified for current adult worker or future day care attendee receptors at Building 643. Three COCs were identified, however, for both future Site residents based on a cumulative hazard index of 1. These COCs were 1,2,4-trimethylbenzene, dichlorodifluoromethane, and trichlorofluoromethane. The residential hazard quotients (child exposure only) were 0.6, 0.3 and 0.2 for 1,2,4-trimethylbenzene, dichlorodifluoromethane, and trichlorofluoromethane, respectively. The 1,2,4-trimethylbenzene hazard quotients were computed using the provisional inhalation reference dose. This application of a provisional toxicity value lends uncertainty regarding confidence that can be placed in the projected hazard indices and resultant remedial goals. No COPC detected in Building 643 was found to exceed its corresponding TLV.

able 40
isk Projections for COPCs
ased on Occupational, Residential, and Childhood Exposure
NC FFI (IAQ) Building 36
harleston, South Carolina

Projected Risk and Hazard

			Current Use		Potential Future Use			
	RfD used	SF used	HQ	ILCR	HQ	ILCR	HQ	ILCR
hemical	(mg/kg-day)	(mg/kg-day)-1	occ - nc	occ - c	res - nc	res - c	chi - nc	chi - c
enzene	0.00171	0.029	0.009	1.5E-07	0.1	1.0E-06	0.04	1.3E-07
hloroform*	0.011	0.0805	0.01	3.2E-06	0.1	2.2E-05	0.04	2.8E-06
hloromethane	2.57	0.0063	0.00002	1.2E-07	0.0002	8.4E-07	0.0001	1.1E-07
4-Dichlorobenzene*	0.229	0.024	0.04	8.6E-05	0.5	5.9E-04	0.2	7.5E-05
azard Indices:			0.06		0.7		0.3	
m ILCR:				9E-05		6E-04		8E-05

NOTES:

HQ	indicates hazard quotient
ICLR	indicates incremental lifetime excess cancer risk
occ	indicates typical occupational exposure assumptions
res	indicates typical residential exposure assumptions
chi	indicates childhood exposure assumptions assuming the building is used twelve hours

able 41
isk Projections for COPCs
ased on Occupational, Residential, and Childhood Exposure
NC FFI (IAQ) Building 643
harleston, South Carolina

Projected Risk and Hazard

			Current Use		Potential Future Use			
	RfD used	SF used	HQ	ILCR	HQ	ILCR	HQ	ILCR
hemical	(mg/kg-day)	(mg/kg-day)-1	occ - nc	occ - c	res - nc	res - c	chi - nc	chi - c
enzene, 1,2,4-trimethyl*	0.00171	NA	0.1	NA	0.6	NA	0.23	NA
hloromethane	2.57	0.0063	NA	1.3E-07	NA	9.1E-07	NA	1.2E-07
ichlorodifluoromethane	0.0571	NA	0.02	NA	0.3	NA	0.1	NA
richlorofluoromethane	0.2	NA	0.02	NA	0.2	NA	0.1	NA
azard Indices:			0.1		1		0.4	
um ILCR:				1E-07		9E-07		1E-07

NOTES:

HQ indicates hazard quotient
ICLR indicates incremental lifetime excess cancer risk
occ indicates typical occupational exposure assumptions
res indicates typical residential exposure assumptions
chi indicates childhood exposure assumptions assuming the building is used twelve hours per day as a Day-Care for children age 1-5 yrs, 260 days/yr for 5 years.
nc indicates noncarcinogen-based exposure assumptions
c indicates carcinogen-based exposure assumptions
SF indicates slope factor
RfD indicates reference dose
\- Some inhalation SF and RfD were not available for COPCs identified; oral SF and RfD were used as surrogate risk information to provide a means of quantifying risk or hazard for these compounds
* The oral RfD for 1,2,4-trimethylbenzene was used in the calculations above; this number was obtained from ECAO, and its applicability for use towards inhalation calculations is unknown.

A provisional subchronic inhalation reference dose is available for 1,2,4-trimethylbenzene. Although the residential hazard projections were based on childhood exposure of less than seven years, the provisional chronic inhalation reference dose was applied due to the potential sensitivity of this receptor group. Subchronic assessment for day care attendees and site workers was not necessary because the more conservatively based chronic assessments for these receptor groups did not result in hazard indices above the acceptable threshold.

5.5.4.3 Building 644 Risk/Hazard

As shown in Table 42, one COC was identified for the current adult worker (1,2,4-trimethylbenzene). The cumulative hazard index for the adult worker was computed to be 1. Two COCs (1,2,4-trimethylbenzene, and trichlorofluoromethane) were identified for future site residents and future day-care attendees based on a cumulative hazard indices of 17 and 6, respectively. The hazard quotient for 1,2,4-trimethylbenzene contributed approximately 95 percent of the total hazard index for each group. The 1,2,4-trimethylbenzene hazard quotients were computed using the provisional inhalation reference dose. This application of a provisional toxicity value lends uncertainty regarding confidence that can be placed in the projected hazard indices and resultant remedial goals. No carcinogenic COCs were identified at Building 644. No COPC detected in Building 644 was found to exceed its corresponding TLV.

A provisional subchronic inhalation reference dose is available for 1,2,4-trimethylbenzene. A similar subchronic value is available for trichlorofluoromethane, the only other COC identified. Although the residential hazard projections were based on childhood exposure of less than seven years, the chronic inhalation reference doses were applied due to the potential sensitivity of this receptor group. The same rationale was used in determining that the chronic inhalation reference dose would be applied for day care attendee hazard projections.

Table 42
Risk Projections for COPCs
Based on Occupational, Residential, and Childhood Exposure
CNC FFI (IAQ) Building 644
Charleston, South Carolina

Projected Risk and Hazard

			Current Use		Potential Future Use			
	RfD used	SF used	HQ	ILCR	HQ	ILCR	HQ	ILCR
Chemical	(mg/kg-day)	(mg/kg-day)-1	occ - nc	occ - c	res - nc	res - c	chi - nc	chi - c
Benzene, 1,2,4-trimethyl*	0.00171	NA	1.4	NA	17	NA	6	NA
Chloromethane	2.57	0.0063	0.00004	2.5E-07	0.0005	1.7E-06	0.0002	2.2E-07
Trichlorofluoromethane	0.2	NA	0.03	NA	0.4	NA	0.1	NA
Hazard Indices:			1		17		6	
Sum ILCR:				2E-07		2E-06		2E-07

NOTES:

- HQ indicates hazard quotient
- ICLR indicates incremental lifetime excess cancer risk
- occ indicates typical occupational exposure assumptions
- res indicates typical residential exposure assumptions
- chi indicates childhood exposure assumptions assuming the building is used twelve hours per day as a Day-Care for children age 1-5 yrs, 260 days/yr for 5 years.
- nc indicates noncarcinogen-based exposure assumptions
- c indicates carcinogen-based exposure assumptions
- SF indicates slope factor
- RfD indicates reference dose
- \- Some inhalation SF and RfD were not available for COPCs identified; oral SF and RfD were used as surrogate risk information to provide a means of quantifying risk or hazard for these compounds
- * The oral RfD for 1,2,4-trimethylbenzene was used in the calculations above; this number was obtained from ECAO, and its applicability for use towards inhalation calculations is unknown.

Subchronic assessment for site workers was warranted because the hazard index computed based on more conservatively based chronic exposure estimates exceeded the acceptable threshold of unity (1). The typical tour at NAVBASE-Charleston for military personnel is two to three years which indicates that most personnel using the facilities at Building 644 would be subject to subchronic exposure. Because CDI projections for chronic and subchronic exposure are not sensitive to the actual exposure duration, which appears in both the numerator and denominator of the formula, a reasonable estimate of subchronic hazard can be computed by applying subchronic reference doses to the CDIs presented in Table 36. As shown in Table 39, the subchronic reference doses for 1,2,4-trimethylbenzene and trichlorofluoromethane are 0.0171 and 2, respectively; each ten times the corresponding chronic values. Application of these values results in a current site worker hazard index of 0.2 which is below the acceptable hazard threshold. This indicates that current (or former) military personnel working in Building 644 are not at risk from airborne exposures. Due to uncertainty regarding future site usage, it cannot be ascertained whether future workers would be subject to chronic or subchronic exposure.

5.5.4.4 Building 656 Risk/Hazard

As shown in Table 43, no receptor group/pathway combination was found to exceed a cumulative ILCR of 1E-4 or hazard index of 1. As a result, no COCs were identified for Building 656. No COPC detected in Building 656 was found to exceed its corresponding TLV.

5.5.4.5 Building 657 Risk/Hazard

Table 44 shows that no COCs were identified for current adult workers or potential future day-care attendees. One COC was, however, identified for future site residents (1,4-dichlorobenzene), which was deemed a COC based on an individual ILCR of 4E-4. The 1,4-dichlorobenzene ILCR was computed using the oral slope factor as a surrogate value for an inhalation slope factor. This application of a surrogate toxicity value lends uncertainty regarding

able 43
isk Projections for COPCs
ased on Occupational, Residential, and Childhood Exposure
NC FFI (IAQ) Building 656
harleston, South Carolina

Projected Risk and Hazard

			Current Use		Potential Future Use			
hemical	RfD used (mg/kg-day)	SF used (mg/kg-day)-1	HQ occ - nc	ILCR occ - c	HQ res - nc	ILCR res - c	HQ chi - nc	ILCR chi - c
enzene	0.00171	0.029	0.03	5.9E-07	0.4	4.1E-06	0.1	5.2E-07
hloromethane	2.57	0.0063	0.00002	1.3E-07	0.0003	8.7E-07	0.0001	1.1E-07
ethylene chloride	0.857	0.00164	0.0004	2.2E-07	0.005	1.5E-06	0.002	1.9E-07
azard Indices:			0.03		0.4		0.1	
um ILCR:				9E-07		6E-06		8E-07

NOTES:

HQ indicates hazard quotient
ICLR indicates incremental lifetime excess cancer risk
occ indicates typical occupational exposure assumptions
res indicates typical residential exposure assumptions
chi indicates childhood exposure assumptions assuming the building is used twelve hours per day as a Day-Care for children age 1-5 yrs, 260 days/yr for 5 years.

'able 44
Risk Projections for COPCs
Based on Occupational, Residential, and Childhood Exposure
CNC FFI (IAQ) Building 657
Charleston, South Carolina

Projected Risk and Hazard

			Current Use		Potential Future Use			
Chemical	RfD used (mg/kg-day)	SF used (mg/kg-day)-1	HQ occ - nc	ILCR occ - c	HQ res - nc	ILCR res - c	HQ chi - nc	ILCR chi - c
,4-Dichlorobenzene*	0.229	0.024	0.03	6.1E-05	0.4	4.2E-04	0.1	5.3E-05
Iazard Indices:			0.03		0.4		0.1	
um ILCR:				6E-05		4E-04		5E-05

NOTES:

HQ indicates hazard quotient
ICLR indicates incremental lifetime excess cancer risk
occ indicates typical occupational exposure assumptions
res indicates typical residential exposure assumptions
chi indicates childhood exposure assumptions assuming the building is used twelve hours per day as a Day-Care for children age 1-5 yrs, 260 days/yr for 5 years.
nc indicates noncarcinogen-based exposure assumptions
c indicates carcinogen-based exposure assumptions
SF indicates slope factor
RfD indicates reference dose
\- Some inhalation SF and RfD were not available for COPCs identified; oral SF and RfD were used as surrogate risk information to provide a means of quantifying risk or hazard for these compounds
* The oral SF for 1,4-dichlorobenzene was used as a surrogate SF; uncertainty in calculated risk is high for this COPC.

confidence that can be placed in the projected ILCR and resultant remedial goals. No non-carcinogenic COCs were identified and no COPC detected in Building 657 was found to exceed its corresponding TLV.

5.5.4.6 Summary of Building-Specific COCs

Table 45 summarizes COCs identified in each building during the FFI. The toxicity endpoints are noted for each COC as well as the receptor group for which each was identified. These COCs were identified irrespective of potential primary sources. The intent of the FFI was to determine whether soil gas or contaminated groundwater migration from SWMU 9 was creating conditions in nearby buildings which could threaten human health. The following paragraphs discuss the findings of the RFI study at SWMU 9 as they relate to plausible soil gas or groundwater volatile contaminant sources correlating with building-specific air data. As summarized in Table 45, benzene, chloroform, 1,4-dichlorobenzene, 1,2,4-trimethylbenzene, dichlorodifluoromethane and trichlorofluoromethane were the only COCs identified in FFI buildings. In order to address potential correlations between these compounds and SWMU 9, the nature of identified contaminants as well as potential migration pathways must be considered. *The Final Zone H RFI Report*, Section 4.0 - Nature of Contaminants was referenced in order to assess the possible connections between SWMU 9 analytical results and FFI air data. Chloroform, 1,2,4-trimethylbenzene, and dichlorodifluoromethane were absent from all shallow groundwater monitoring wells at SWMU 9 indicating that the landfill does not represent a source of these compounds. In the absence of a landfill source, an alternative hypothesis must be accepted that these volatile compounds are not associated with SWMU 9.

Table 45
Chemicals of Concern Identified
In Each Building in the FFI Study
Charleston, South Carolina

COC	Building				
	36	643	644	656	657
Benzene	X(c-r)				
Chloroform	X(c-r)				
1,4-Dichlorobenzene	X(c-r)				X(c-r)
1,2,4-Trimethylbenzene		X(nc-r&dc)	X(nc-w,r&dc)		
Dichlorodifluoromethane		X(nc-r&dc)			
Trichlorofluoromethane		X(nc-r&dc)	X(nc-w,r&dc)		

Notes:
'X' Indicates the compound was identified as a COC in the building shown.
'c' and 'nc' Indicate whether the toxicity endpoint is carcinogenic or systemic non-carcinogenic, respectively.
'w','r', and 'dc' Indicate whether the COC was identified relative to current adult worker, future site resident or future day-care attendees.

1,4-Dichlorobenzene, benzene, and trichlorofluoromethane were each detected in at least one shallow RFI monitoring well installed at SWMU 9 during first and second quarter sampling. 1,4-Dichlorobenzene was detected in monitoring wells NBCH-009-10, NBCH-009-13 and NBCH-009-14. Benzene was detected in monitoring wells NBCH-009-01, NBCH-009-03, NBCH-009-07, NBCH-009-09, NBCH-009-10, NBCH-009-12, NBCH-009-13, NBCH-009-14, and NBCH-009-16 over the two quarterly monitoring events. Trichlorofluoromethane was detected in one second quarter groundwater sample from monitoring well NBCH-009-07. With the exception of monitoring well NBCH-009-10, each well in which FFI-based air COCs were identified is located on the western half of SWMU 9, or a minimum of approximately 1,500 feet from the closest FFI buildings (Buildings 655 and 656). Monitoring well NBCH-009-10 is located in the middle of the running track which was constructed on the landfill cap; approximately 900 feet west of Buildings 655 and 656. No COCs were detected in wells closest to the FFI buildings.

The location of these wells relative to the buildings investigated during the FFI is important in that any conclusion linking the SWMU 9 landfill to air contaminants identified at individual buildings must necessarily be supported by the identification of both a source and a migration pathway. In the case of 1,4-dichlorobenzene, benzene and trichlorofluoromethane, presence in SWMU 9 shallow wells confirms the existence of a potential source. Three shallow monitoring wells are located in a loose arc along the east and northeast boundaries of SWMU 9 (NBCH-009-05, NBCH-009-08 and NBCH-009-11). These wells are located slightly downgradient with respect to SWMU 9. As indicated the preceding paragraph and Section 4 of the RFI report for Zone H, none of the air pathway COCs were identified in these wells during first and second quarter sampling. Based on these findings, there exists no basis to conclude that 1,4-dichlorobenzene, benzene and trichlorofluoromethane (air pathway COCs) are associated with volatile groundwater contaminants migrating from SWMU 9.

The question remains as to the source of air COCs identified during the FFI. Evaluation of RFI data for the SWMU/AOC closest to each building was considered the next logical step in attempting to identify potential sources. Building 36 does not have an RFI SWMU/AOC in close proximity. Soil samples at GDH80 and groundwater samples from grid well GDH04 were the closest to Building 36 but none of the air COCs were identified in these samples. Building 643 is closest to SWMU 9, and thus previous conclusions stand for this area. SWMU 13 is the RFI site in closest proximity to Building 644. No Building 644 air COC was identified in any soil or shallow groundwater sample from SWMU 13. AOC 656 is located in close proximity to Building 657. No air COC identified in Building 657 was detected in soil or shallow groundwater samples from AOC 656.

Based on this comparison of FFI and RFI data, it may be concluded that not only is SWMU 9 not the source of air COCs but that there do not appear to be any identifiable sources of these indoor air contaminants associated with more proximate current or former hazardous waste operations. As a result, it would appear that the air COCs identified during the FFI may, in fact, be associated with the individual building operations. Investigation of the possible building-specific sources (apart from specific SWMU and/or AOC investigations) is outside the scope of the FFI as well as the RFI. Results at Buildings 643 and 644 may reflect impacts associated with firefighter training exercises conducted on an adjacent lot during Phase II air sampling activities.

5.6 Risk Uncertainty

This section presents and discusses the uncertainty inherent in the risk assessment process in addition to medium- and exposure pathway-specific influences. Risk assessment sections are discussed separately below, and specific examples of uncertainty sources are included where appropriate.

5.6.1 General

Uncertainty is a factor in each step of the exposure and toxicity assessments presented in the preceding sections. Overall, uncertainties associated with the initial stages of the risk assessment process become magnified when they are combined with other uncertainties. It is not possible to eliminate all uncertainties; however, recognition of the uncertainties is fundamental to the understanding and subsequent use of risk assessment results.

This section presents the uncertainty of Site-specific and medium/pathway specific factors introduced as part of the risk assessment process, in addition to other factors influencing the uncertainty of the calculated incremental excess cancer risks and hazard quotients/indices.

Assumptions are made as part of the risk assessment process based on population studies and USEPA guidance. This guidance divides the assumptions into two basic categories: the upper bound (90-95th percentile) and the mean or 50th percentile (central tendency) exposure assumptions. As discussed in the Exposure Assessment Section, the Reasonable Maximal Exposure (RME) is based on the upper bound assumptions. Therefore, risk/hazard calculated using RME assumptions are generally overestimates rather than underestimates. The following paragraphs discuss sources of uncertainty pertinent to the air exposure pathway evaluated in the BRA.

5.6.2 Risk-Based Screening

Comparison to USEPA Region III ambient air screening values was performed as a tool for COPC identification. As discussed in the Determination of COPCs section of this BRA, risk-based screening was performed to determine which chemicals would most likely be identified as COC. COC were identified for any building-specific exposure pathway which was determined to exceed an incremental excess cancer risk of 1E-4 or a hazard index of 1. For the identified buildings/scenarios of concern, all reported concentrations which individually exceeded an incremental excess cancer risk of 1E-6 or a hazard index of 0.1 were considered COC.

Exposure pathways and contaminants were initially eliminated from the BRA based on the criteria agreed on by USEPA, SCDHEC, and the Navy. The risk/hazard thresholds of 1E-6 and 0.1 were selected to account for potential cumulative effects of various chemicals, and the maximum concentration detected anywhere in a building was compared to the corresponding screening value. As discussed previously in this BRA, the comparison was made using the most conservative (residential) screening value provided by USEPA Region III and USEPA Region IV. Another comparison was made to occupational-based screening values. COPCs identified using this conservative screening method were addressed in the risk assessment only if a potential exterior source was identified. In addition, the potential does exist for chemicals not identified in BZ or GL samples to eventually infiltrate the buildings. Conversely, potential external sources were not identified for some chemicals detected in BZ or GL samples. These chemicals were not identified as COPCs, and it is uncertain whether the quantitation limits influence the list of COPCs. This is discussed further in Sections 5.6.4 and 5.6.6.

Some uncertainty exists in the sum effect of exposures to numerous constituents near the screening values. The fact that maximum concentrations detected were used as screening concentrations in concert with low range risk/hazard thresholds, however, alleviates much of the uncertainty related to the potential for adverse cumulative effects from the detected chemicals eliminated from the formal assessment. In addition, the list of COPCs was determined using the residential screening values which are highly conservative relative to the occupational screening values (as shown in the screening previously presented screening tables).

5.6.3 Quality of Data

Air

As described in previous sections of this FFI Report, the data quality objective was CLP level III for Phase II FFI air sampling. As discussed in Section 3.2.5, all COPC were detected in QA/QC blanks. These blanks apply only to certain groups of samples (i.e., those they are collected with). The applicable guidance for data validation suggests that chemicals detected in site samples be rejected or qualified based on specific criteria, and one criterion is the detection of a chemical in blank samples that apply to corresponding site samples. Chemicals were eliminated from FFI samples based on this criterion. However, those chemicals not detected in corresponding blanks were retained.

Considerable uncertainty exists with respect to the list of COPCs developed based on the DQO level of data collected (Phase I) and the number of chemicals eliminated or qualified as part of data validation. Level IV was used in Phase II to reduce this source of uncertainty. Validation of Phase II data resulted in the 'U' qualification of many hits for benzene (39 samples), 1,4-dichlorobenzene (20 samples), 1,2,4-trimethylbenzene (18 samples), dichlorodifluoromethane (19 samples) and trichlorofluoromethane (16 samples) based on method and/or field blank contamination as discussed in Section 3.2.5. Because some of these compounds were ultimately identified as COCs based on their presence in other samples, less confidence can be placed in the outcome of related risk/hazard projections. In each instance, decisions regarding retention of compounds as COPCs (and subsequently COCs) were made in order to maintain the conservative nature of the overall approach.

As discussed in Section 5.5.4.6, no apparent source/migration pathway combinations were identified between SWMU 9 and the FFI buildings. Furthermore, analysis of RFI data collected at SWMU/AOC close to each building failed to identified viable sources for the air pathway COCs. As a result, limited confidence can be held in the projected risk/hazard for each building as it relates to activities within the scope of the Zone H RFI.

In addition to the detection of COPC in QA/QC data, the FFI sampling effort was biased towards potential hot spots. Samples were collected only where floor cracks were evident, and this bias has conservatively skewed BRA results. Therefore, based on the data validation method used (elimination of only those chemicals detected in blanks and corresponding samples) and biased air sampling, data presented here provides a conservative representation of airborne contaminants.

5.6.4 Characterization of Exposure Setting and Identification of Exposure Pathways

Uncertainty in the exposure setting and pathways exists due to the highly conservative assumptions (i.e., future residential use) when assessing potential future and current exposure. The current use exposure pathways selected for assessment would be expected as part of normal daily work activities. Principle activities are centered around Zone H offices, classrooms, and exchange, and the time of military service would not be expected to last 25 years (which was assumed for occupational exposure duration). According to NAVBASE personnel, the typical 'tour' consists of two to three years of shore duty, and upwards of five years of sea duty. This standard duty combination supports assessment of subchronic exposure potential as discussed in Section 5.5.4. Infrequently military personnel have been stationed onshore for periods exceeding seven years. Civilian employees could hypothetically work at the same location for 25 years under current and project future site uses. The Charleston Naval Base is currently fenced and under armed guard by the Navy, and the likelihood of chronic exposure to trespassers is extremely low.

Exposure assumptions, presented in the Quantification of Exposure Section of this BRA are highly conservative, especially the potential future use exposure pathways. The corresponding risk projections are therefore highly conservative. Potential future scenarios assuming site residency and use as a day care greatly influences the risk projections in terms of exposure duration and exposure frequency. In addition, the lifetime weighted average of potential child and adult Site residents was used for the residential (carcinogen) risk calculations. Actual future building uses could deviate from those proposed because ultimate reuse has not been determined, and the uncertainty is high due to these conservative exposure assumptions. The maximally exposed individual was assumed to be a worker rather than a resident or recreational user due to the 25 year exposure duration. The result of assuming 25 years for occupational exposure duration would tend to be an overestimate of risk/hazard for current/future use conditions due to the selected exposure scenarios and corresponding assumptions. In addition, chronic exposure is considered to be greater than seven years, and many military transfers would occur prior to seven years. Subchronic toxicity values were applied and discussed in Section 5.5.4 where appropriate. However, the future of the buildings is uncertain because the facility reuse is undetermined. It is not possible to predict construction modifications and internal layout changes, but it is doubtful that certain buildings' uses will change as they were built for specific purposes in mind (i.e., the bowling alley will remain a bowling alley).

5.6.5 Determination of Exposure Concentrations

Based on the guidance provided by USEPA, Exposure Point Concentrations (EPC) are those concentrations used to estimate Chronic Daily Intake (CDI). The uncertainty associated with EPC primarily stems from their frequency of detection and spatial distribution. Worker activity patterns and spatial distribution of contaminants in buildings were not used to adjust risk projections. As a result, COPCs having low frequency of detection (and having concentrations relatively greater than ubiquitous concentrations) would positively bias the risk projections. As shown in Table 46, many chemicals identified as COPCs for other buildings were detected at concentrations that did not exceed the screening level and/or a potential external source was not identified.

Table 46
Frequency of Detection of Chemicals of Potential Concern Identified In Breathing Zone and Ground Level Samples Charleston, South Carolina

COPC	Building							
	36	NS84	202	643	644	645	656	657
Benzene	**1/6**						**6/12**	
Chloroform	**2/6**							(1/6)
Chloromethane	**6/6**	(3/6)		**6/6**	**3/6**		**10/12**	(2/6)
1,4-Dichlorobenzene	**6/6**						(6/12)	**5/6**
1,2,4-Trimethylbenzene				**5/6**	**6/6**		(8/12)	(1/6)
Dichlorodifluoromethane	(6/6)	(6/6)	(3/6)	**6/6**	(6/6)		(12/12)	(6/6)
Trichlorofluoromethane	(6/6)	(4/6)	(2/6)	**6/6**	**6/6**		(12/12)	(6/6)
Methylene chloride	(4/6)						**11/12**	

Notes:

— The numbers above indicate the frequency of detection over the number of BZ and GL sample locations analyzed. Compounds were identified as COPCs in the buildings shown (i.e., **bold** numbers not in parenthesis indicate a potential external source was identified).

— The numbers in parenthesis indicate that a COPC was detected in a building, and either the concentrations did not exceed the residential screening value, and/or a potential external source was not identified.

— Refer to Tables 19 through 26 for a detailed presentation of screening comparisons.

As shown in the Table 46, chemicals identified as COPCs in some buildings were detected in other buildings, where they chemicals were not identified as COPCs. However, these chemicals either did not exceed the corresponding screening value, or the chemicals were not identified as having a potential external source. Higher concentrations identified as COPCs could be attributed to the building use (i.e., diesel engine room) or an external source. It is uncertain whether the potential external sources identified in the buildings are viable due to the high air flow (evident as part of the carbon dioxide content) and generally elevated concentrations in BZ and GL samples when compared to concentrations detected in subslab samples. Refer to Appendix A for detailed building use descriptions and contents.

Spatial patterns of COPC appear to be randomly distributed, and this could be an additional indication of laboratory contamination. Based on the COPC detected in QA/QC data and the quantitation limits for corresponding data, many COPC could be present in blanks at lower concentrations. As discussed in the Section 3.2.5, these compounds would have been eliminated based on corresponding blank contamination.

The method used to determine EPC would skew risk projections in the conservative direction. Assuming equivalent accessibility to GL and BZ samples, the three day mean was calculated separately for GL and BZ samples, and the maximum of the mean concentrations was used as EPC. Areas with the highest identified concentrations were used to assess risk in the FFI, and this bias is highly conservative.

Of greater importance to the Building 643 and 644 assessments, it was noted that the adjacent Fire Fighter Training facility conducted training operations during the monitoring period. 1,2,4-Trimethylbenzene would be expected to be present in petroleum products used in the training operations. It was noted in Section 3, pages 3-10 and 3-29 that smoke clouds emanating from the training area engulfed these buildings due to stagnant air conditions.

5.6.6 Toxicity Assessment Information

There is a generally recognized uncertainty in human risk values developed from experimental data primarily due to the uncertainty of data extrapolation in the areas of: (1) high to low dose exposure and (2) animal data to human experience. The site-specific uncertainty is mainly in the degree of accuracy of the exposure assumptions. Most of the assumptions used in this and any risk assessment have not been verified. For example, the degree of chemical absorption from the gut or through the skin or the amount of soil contact is not known with certainty. Generally accepted default values provided in USEPA guidance were used. However, little data or guidance is available on the dermal absorption of particulate-bound chemicals. In the risk assessment conducted for the study area, the dermal pathway was assumed to contribute to overall CDI for the soil pathway, although the transdermal transport of each COPC has not been quantified experimentally.

Uncertainty values are assigned to most toxicity values used in risk assessment. The uncertainty factors assigned to these values account for acute to chronic dose extrapolation, study inadequacies, and sensitive subpopulations among other factors. Although uncertainty factors for a specific compound may be 1,000 or higher, these safety factors are applied by USEPA to assist in guaranteeing the overall assessment of risk/hazard is conservative towards human health concerns. In the presence of such uncertainty, the USEPA and the risk assessor are obligated to make conservative assumptions, so the chance is very small for the actual health risk to be greater than what is determined through the risk assessment process. On the other hand, the process is not to yield absurdly conservative risk values that have no basis in reality. This balance was kept in mind in the development of exposure assumptions and pathways and in the interpretation of data and guidance for this BRA.

In order to quantify risk, it is often necessary to use oral SF and RfD as inhalation SF and RfD. There is a significant amount of uncertainty involved in such route to route extrapolation of risk information. The target organ and critical effect could change, and this should result in different oral and inhalation risk information. However, this information is not usually available for all contaminants identified at any one site, and assumptions must be made to quantify risk for the contaminants in question.

Evaluation of Chemicals for Which No Toxicity Values Are Available

In addition to the typical uncertainties inherent in toxicity values, parameters which do not have corresponding RBCs due to the lack of approved toxicological values were not included in the CDI calculation data. No toxicity values or surrogate toxicity values were available for para-ethyltoluene and dichlorotetrafluoroethane. Therefore, the risk posed by these air contaminants is unknown. However, surrogate and provisional risk information were used wherever possible, and this information was noted on Table 39 and subsequent risk presentation Tables 40 through 44 (all tables were previously presented).

The uncertainty of COC identified in Risk Characterization is increased due to the surrogate information employed in the calculations. An oral SF was used as the inhalation SF for 1,4-dichlorobenzene, and a provisional inhalation RfD provided by USEPA, NCEA was used for 1,2,4-trimethylbenzene. Application of the oral SF for 1,4-dichlorobenzene as the inhalation SF has been sanctioned by USEPA Region IV based on presumed similarities in the mode of entry to the circulatory system. The provisional status combined with the oral basis of these numbers increases the uncertainty. Where inhalation SF and RfD not available in IRIS, significant uncertainty would exist in the risk calculations based on these oral-derived numbers. It is important to note that these two compounds, 1,4-dichlorobenzene and 1,2,4-trimethylbenzene, were the primary contributors to risk and hazard for any building and exposure pathway. If the surrogate and/or provisional substitutions were not made, no COC would have been identified in this risk assessment.

The possible ARARs for these buildings are TLVs, as established by ACGIH. No chemical concentrations approach the corresponding TLVs. These concentrations would be applicable to industrial occupational exposure per OSHA standards.

5.6.7 Uncertainty Summary

As indicated by the discussions above, the uncertainty inherent in the risk assessment process is great. In addition, many site-specific factors have affected the uncertainty of this assessment.

Six primary factors were discussed:

- COPCs detected in unassociated blank samples.
- Conservatively biased sampling.
- Potential current building use influences (i.e., laundry room, diesel room, etc.).
- Highly conservative current and future land use and exposure assumptions.
- Oral to inhalation extrapolation of provisional toxicity values resulting in risk and hazard exceedances.
- No SWMU/AOC-related source/migration pathways were identified for any air COC identified in the FFI.

As a result of using provisional oral SF and RfD for inhalation risk/hazard calculations, COC were identified in some buildings. Two COPCs, 1,4-dichlorobenzene and 1,2,4-trimethylbenzene, were the primary contributors to risk/hazard in each building where COCs were identified. Provisional and/or surrogate SF and RfD values were used for each.

5.7 Risk Summary

Risk characterization identified several COC for the air exposure pathway, and most were based upon hypothetical residential and day care future use scenarios. As discussed in Section 5.6, these land use assumptions are extremely conservative due to the nature of the buildings assessed, and due to the layout and potential buildings use. The use of these buildings would not be expected to change (i.e., the bowling alley will remain a bowling alley).

Carcinogen-based COC were identified in only two buildings, Building 36 and Building 657, and 1,4-dichlorobenzene was the primary contributor to risk in each. In only two buildings, 643 and 644, 1,2,4-trimethylbenzene was the primary contributor to hazard index in each. Provisional or surrogate toxicity values for the primary contributors to both risk and hazard in all building were used in the risk/hazard calculations. If not for the application of these surrogate and provisional values, no building-specific pathway would exceed ILCR of 1E-4 or HI of 1. Please refer to Section 5.6 for a discussion of the uncertainty in this BRA. A summary of risk and hazard calculated for COC identified in each building is shown below in Tables 47 and 48, respectively.

Based on the reported firefighter training activities on an adjacent property during Phase II sampling at Buildings 643 and 644, limited additional sampling may be advisable to confirm the connection between detected 1,2,4-trimethylbenzene (and other COCs) and the dark smoke cloud that engulfed the buildings under stagnant air conditions. No similarly plausible explanation for 1,4-dichlorobenzene hits in Buildings 36 and 657 was identified.

Table 47
Risk (ILCR) Summary Table
FFI Study
Charleston, South Carolina

COC	Building	
	36	657
Benzene	1E-6	
Chloroform	2E-5	
1,4-Dichlorobenzene	6E-4	4E-4

Notes:
— The risk identified above applies only to the potential future land use (residential) exposure scenario. No risk-based COC were identified for any other exposure scenario.

Table 48
Hazard (HQ) Summary Table
FFI Study
Charleston, South Carolina

COC	Building				
	643		644		
	residential	day care	worker	residential	day care
1,2,4-Trimethylbenzene	0.6	0.23	1.4	17	6
Dichlorodifluoromethane	0.3	0.1			
Trichlorofluoromethane	0.2	0.1	0.03	0.4	0.1

Notes:

— The hazard quotients presented above are a summary of the COC identified in each of the three exposure scenarios with chronic exposure assumptions: worker, residential, and day care (as noted in the table).

— The worker scenario is a current land use scenario; the residential and day care scenarios are both potential future land use scenarios.

APPENDIX A

BUILDINGS SURVEYED

(This appendix represents field personnel's transcribed, unedited field notes.)

BUILDING SURVEY SUMMARIES

BUILDING X25 — Laundromat
The original structure was built in the 1940's. This area has exposed concrete floors with some shrinkage cracks visible. There was an addition to the building, date unknown. This area has tiled floors and there is no visible evidence of severe cracking of the underlying slab. There is some slight separation of the construction joint, but no air flow through the crack was noticed. All pipe openings in the floor appear to be well sealed. There are no visible soil subsidence problems around the exterior perimeter of the building.

BUILDINGS NS31-38 — Barracks
These barracks buildings are of similar construction. There have been no additions to any of the buildings. There are no expansion joints visible in any of the buildings. All floor space is either carpeted or tiled and there is no visible evidence of severe cracking of the underlying slab. The bathrooms and washrooms of all buildings were inspected. All plumbing connections appear to be well sealed except for the washroom of Building 36, where air flow is noticeable through an opening around a pipe. There are no visible soil subsidence problems around the exterior perimeter of the structures. Building 37 was not inspected because it is currently unoccupied an unaccessible due to asbestos contamination. Building 38 was once a barracks similar to the others. However, all interior and exterior walls have been removed leaving only the structural frame.

BUILDING NS43 — Dining Hall
All floor area is covered with floor tile and there is no visible evidence of severe cracking of the underlying floor slab. All plumbing appears to be well sealed. There are no visible soil subsidence problems around the exterior perimeter of the structure.

BUILDING NS46 — NAVSTA Headquarters
All office and hallway space is tiled or carpeted and there is no visible evidence of severe cracking of the underlying floor slab. All building expansion joints appear to be well sealed. Any visible plumbing enters a room through the walls and all plumbing appears to be well sealed. There is a gymnasium, weight room, and racquetball court in the northwest corner of the building. The gym and racquetball court have hardwood floors and the weight room is carpeted. There is no evidence of cracking in the underlying slab. The racquetball court is the only known addition to the structure. It connects to the original building through a short, carpeted hallway. There is a depression in the carpet which could indicate severe cracking of the underlying slab. The crack appears to be located at the construction joint of the racquetball addition. There are no visible soil subsidence problems around the exterior perimeter of the structure.

BUILDING NS53 — Barber Shop and Storage
The barber shop and office spaces have tiled floors. There is no visible evidence of severe cracking of the underlying slab. The storage area floor is completely exposed. There are several shrinkage cracks present. Soil subsidence has occurred on the north and east sides of the building.

BUILDING NS54 — Billeting Office
This facility is a small office approximately half the size of a trailer. All floor space is tiled or carpeted, and there is no visible evidence to indicate severe cracking of the underlying slab. There are no noticeable soil subsidence problems around the exterior perimeter of the building.

BUILDING FBM61 — FBM Sub Training Facility
Ross Cummings 743-2893
The original training building was constructed in 1963. Since that time, there have been eight(8) additions to the structure, with the latest being in 1980. As with several other buildings on base, the construction joints at the additions are likely to eventually separate due to differential settlement of separate building sections. There is no evidence to indicate that this has occurred as of yet. Unfortunately, the majority of the ground level of the building has raised, tiled floors. Thus, cracking of the floor tile does not indicate cracking of the floor slab. The only method to determine the presence and extent of floor cracking is to raise floor tile panels to allow direct inspection of the slab below. Where this was possible, there was no noticeable cracking of the floor slab. Some mechanical areas have an exposed concrete slab floor. In these areas, the floor joints appear to be well sealed and there is only minor shrinkage cracking visible. Any piping extending through the floors in these areas is well sealed. There are no visible soil subsidence problems around the exterior perimeter of the building.

BUILDINGS 65,66,67, and 652 — Barracks
The floor area of each building is carpeted or tiled and there is no visible evidence of severe cracking of the underlying slab in any building. None of the buildings has had any additions, and there are no visible expansion joints in any of the buildings. All plumbing appears to be well sealed. There are no soil subsidence problems visible around the exterior perimeter of the structures.

BUILDING NS71 — Mini-mart
All floor area is tiled or carpeted and there is no visible evidence of cracking of the underlying slab. All plumbing appears to be well sealed. There is significant settling of the soil along the rear of the building, allowing air to flow underneath the building.

BUILDING NS79 — Dispensary
There have been no additions made to this structure. All floor space is either carpeted or tiled, and there is no visible evidence of severe cracking of the underlying floor slab. There are some unsealed pipe openings in a mechanical room which allow air to flow in from beneath the structure. There is minor soil subsidence along the exterior perimeter of the structure, but no openings below the grade beams have been created.

BUILDING NS84 — Naval Security Group Activity
The original structure was constructed in the 1960's and has had at least one addition. The construction joint at the addition has begun to crack and separate. All floor space is carpeted. At the construction joint, the carpet was able to be pulled aside in order to view the joint cracking and separation. However, the floor slab was not visible in any other areas, thus, no other cracking of the slab was found. All visible plumbing appears to be well-sealed. There is considerable soil subsidence along the north end of the building. This allows outside air to flow beneath the structure. There is also minor soil subsidence on the east side of the structure.

BUILDING 202 — Fleet and Mine Warfare Instruction Building

Chief Meader 743-1799

There has been one addition, and possibly a second, made to this building. At the floors, the construction joints are covered by metal plates and can not be inspected. However, the vertical construction joints at the wall intersections have begun to separate, with noticeable air flow through the crack. All other floor space is carpeted or tiled, and there is no visible evidence of severe cracking of the underlying slab. There are no soil subsidence problems visible around the exterior perimeter of the building.

BUILDINGS 636 and 1493 — Auto Hobby Shops

These buildings are similar to rental storage buildings which have many separate storage rooms, each accessed by a roll-up door. The storage areas are used as personal auto repair bays. The floor areas are exposed concrete with shrinkage cracking at regular intervals. There are no noticeable soil subsidence problems around the exterior perimeter of either building.

BUILDING 638 — Bath House

Tony Folk 743-5085

This structure is fairly small and has had no additions. The entire floor area is exposed, and shrinkage cracking is prevalent throughout the building. However, there are no major openings visible in the slab. All plumbing enters rooms through the walls and appears to be well sealed. There are no noticeable soil subsidence problems around the exterior perimeter of the structure.

BUILDING 640 — Steamers (CPO Club)

The majority of floor space in this structure is carpeted or tiled, and there is no visible evidence to indicate severe cracking of the underlying floor slab. There are some storage areas which have an exposed concrete floor. In these areas, there is visible shrinkage cracking of the concrete. There is piping which penetrates the floor slab in an ice area that is not sealed properly. Air flow through the opening from beneath the slab is noticeable. Some soil subsidence has occurred around the building perimeter, which has created an opening underneath the grade beams.

BUILDING 642 — McDonald's

All floor space in the McDonald's building is tiled. There is no visible evidence to indicate severe cracking of the underlying floor slab. All plumbing connections appear to be well sealed. There is minor soil subsidence along the outside perimeter of the structure. This has caused the sidewalk to settle and crack in some locations. However, the subsidence has not created any openings below the grade beams.

BUILDING 643 — Fleet and Mine Warfare Training Building

Chief Meader 743-1799

The majority of the ground floor space in this structure is carpeted or tiled. There is a small area in the hallway where the floor tile is "bubbled" and cracked. The cause of this is unknown. Other than this, there is no visible evidence to indicate severe cracking of the underlying floor slab in the carpeted and tiled areas. There are two large areas which do have an exposed slab floor. The largest of these areas is Room 119, the Mines Lab. This is a large, open room, similar in appearance to a warehouse. The long axis of the room runs east-west. In this direction, there is a single shrinkage crack located approximately in the center of the room which runs the full length of the room. This should have been the location of a control joint when the floor was originally poured. There are control joints running across the room in the short direction at approximately 15 foot intervals. These joints appear to be well-sealed. An addition was made to the east end of the building. The construction joint is visible in the hallway and appears to be well-sealed, with no cracking of the surrounding floor tile. Another area with an exposed slab floor is the MNS room, which is located in the addition area. This room is directly adjacent to the original building, with the west wall of the room being the exterior east wall of the original building. In the MNS room, the construction joint of the addition is clearly visible along this wall. There is visible separation of the construction joint of approximately one-eighth(1/8) to one-quarter(1/4) inch. All visible piping connections appear to be well sealed. There are no noticeable soil subsidence problems around the exterior perimeter of the structure. However, the grade beams are mostly hidden by flashing and/or mulch used to make flower beds.

BUILDING 644 — Bowling Center

The original bowling center consisted of 13 lanes that were built in 1964. There have been two additions to the structure, in 1967 and 1968. The construction joints of both additions have begun to separate due to differential settlement, and considerable air flow through the cracks is noticeable. The majority of floor space is covered by carpet, tile, or hardwood floor for bowling lanes. There is no visible evidence to indicate severe cracking of the underlying floor slab. The floor slab is exposed in the area behind the bowling lanes. Shrinkage cracking of the floor slab is visible in this area. Soil subsidence has occurred around the exterior perimeter in some locations, creating openings beneath the grade beams of up to 6 inches.

BUILDING 645 — Fleet and Mine Warfare Engine Overhaul Facility

Chief Meader 743-1799

This facility is used for diesel engine repair training. It appears to be unoccupied most of the time, and was so at the time of the survey. There has been an addition made to the structure. The original building consisted of what is now rooms 101,102, and 103. The addition consists of room 104 and 105. Room 105 has a tiled floor. The remaining floor space has an exposed floor slab. There is visible shrinkage cracking of the exposed floor slab in all rooms. The construction joint for the addition runs along the wall between rooms 102 and 104. Differential settlement of the two building sections has caused the construction joint to separate by approximately one-eighth(1/8) to one-quarter(1/4) inch, which could allow air to flow up into the building from the space beneath the floor slab, although no air flow was noticeable. This settlement is also noticeable along the vertical construction joint between intersecting concrete block walls. There are several piping connections which are not well sealed at the floor, most notably in room 105. There is no noticeable soil subsidence around the exterior perimeter of the building. However, there is vertical cracking of the grade beam in the vicinity of the doorway into room 104, which could allow air to enter the area beneath the floor slab.

BUILDING 646 — COMSUBGRU 6 Administration and Training

Petty Officer Stephenson

This facility consists of two separate buildings which are joined by an enclosed hallway. The buildings were constructed at different times. Other than the construction of the newer building, there have been no additions to either building. There are no visible expansion joints in either structure. All floor areas are either tiled or carpeted and there is no visible evidence to indicate severe cracking of the underlying slab. However, there is visible cracking in the floor tile at the construction joints at each end of the connecting hallway, indicating that the construction joints may be beginning to separate slightly. All visible plumbing appears to be well-sealed. There are no visible soil subsidence problems around the exterior perimeter of the buildings.

BUILDING 647 — Fleet and Mine Warfare Training Building

Chief Meader 743-1799

The majority of floor space in this building is either carpeted or tiled, and there is no visible evidence of severe cracking of the underlying floor slab. The only area with an exposed floor slab is room 137(equipment room). There are many visible hairline shrinkage cracks in this room. The building was constructed approximately 1965, with no additions. There is no visible expansion joint in the building. There are no noticeable soil subsidence problems around the exterior perimeter of the structure. However, much of the perimeter grade beams are hidden by mulch used to form flower beds.

BUILDING 648 — Supply Depot

There is no visible evidence of floor slab cracking in the interior of the structure and there are no openings in the slab. There is considerable soil subsidence around the perimeter of the structure. In some locations, the soil is settled below the grade beams by as much as 15 inches, allowing air to flow beneath the structure.

BUILDING 649 — Fleet and Mine Warfare Warehouse

Chief Meader 743-1799

This structure is a typical pre-engineered "Butler" building used for storage. There are no office areas and the building is mostly unoccupied. The floor slab is entirely exposed. There are several visible shrinkage cracks in the floor due to lack of control joints in the slab. The base of the metal siding is not sealed to the floor slab, which allows outside air to enter the building. There are no pipes entering the structure. There are no visible soil subsidence problems around the exterior perimeter of the structure.

BUILDING 650 — Post Office

This building was constructed in approximately 1967, and has had no additions. The majority of the floor area is tiled and there is no visible evidence of severe cracking of the underlying slab. There are shrinkage cracks visible in the areas with exposed slab. All plumbing and piping appears to be well sealed. There are no visible soil subsidence problems around the exterior perimeter of the building.

BUILDING 653 — Barracks

PO Yonkers

All floor space is carpeted or tiled and there is no visible evidence of severe cracking of the floor slab below. All piping appears to be well sealed. There is only minor soil settling around the exterior, but there are no open spaces below the grade beams.

BUILDING 654 — Personnel Support Detachment

There has been one large addition made to the southwest end of the original structure. At the construction joint, there is no visible cracking of the surrounding floor tile and the joint appears to be well sealed. All floor space is either carpeted or tiled, and there is no visible evidence to indicate severe cracking of the underlying floor slab. All plumbing enters rooms through the walls and appears to be well sealed. The condition of the pipe floor connections is unknown. There is some soil subsidence along the back wall of the original building which creates an opening beneath the grade beams. This has been mostly hidden by boulders placed against the building wall.

BUILDING 655 — Commissary

MR Martinez 743-4055

This structure is divided into two major areas: the shopping area and the warehouse area. There is an expansion joint along the division between the two areas. This joint is entirely hidden by a wall partition except across one doorway opening. At one point, though, there is a large hole in the wall partition which allows inspection of the expansion joint. This joint appears to still be well sealed. However, there is some indication on the front sidewalk that the building is beginning to settle. At the approximate location of the building expansion joint, there is an uneven spot and cracking in the front concrete walkway. This could indicate the beginnings of differential settlement between the two building sections. The shopping area is completely tiled except for one or two offices which are carpeted. There is no visible evidence to indicate severe cracking of the underlying slab. The warehouse area has a completely exposed concrete floor slab, with well sealed control joints. There are several hairline shrinkage cracks visible throughout the entire floor area, but no severe structural cracks are visible. There are several locations around the exterior perimeter of the building where the soil has subsided considerably, creating an opening under the grade beams which allows air to flow underneath the structure.

BUILDING 656 and 623 — Exchange and Garden Shop

Pat Caparas, Admin. Office Manager 743-3667 or 743-5798

The exchange building has had two major additions. The original structure consisted only of the major front shopping area. The first addition was the warehouse to the south of the shopping area.. The second addition was to the back(west side) of both the shopping area and the warehouse. There is a construction joint between each "existing" structure and the adjacent addition. Thus, the entire exchange is divided into four corner rectangles by construction joints. There is severe differential settlement of all four sections of the building. This has caused all construction joints to begin to separate. In some locations, the joints have separated by as much as 2 inches. The air flow through these cracks is very noticeable, as is a musty odor, typical of any tight crawl space below a building. However, there are no gaseous vapors noticeable. The floor in the shopping area is tiled or carpeted, and there was no visible evidence of severe cracking of the underlying floor slab. The warehouse area floor is completely exposed, and typical shrinkage cracking is visible over the entire floor area. There is considerable soil subsidence around the exterior of the building. In some locations, the soil has settled away from the bottom of the grade beam by as much as 18-24 inches. There is considerable air flow underneath the structure. There are no visible concerns in the garden shop (Building 623).

BUILDING 657 — Sports Bar

William Guffin 743-5266

The sports bar building was added on to in approximately 1978 to expand the southwest corner of the building. A portion of the south and west exterior walls of the original building were removed, creating a large open area in that corner of the building. This area is currently used as a dance floor and is covered with tile. There is considerable cracking of the floor tile along the construction joints where the original south and west walls were located. The crack is as wide as one-quarter(1/4) inch. There was no noticeable air flow through the crack. However, the crack is suspected to be open to the space beneath the floor. Mr. Guffin was unaware of any complaints that had ever been made concerning foul odors (i.e., gas fumes) entering through the cracks. All visible plumbing connections appear to be well sealed. There is some soil subsidence around the exterior perimeter of the building, creating openings to the space below the floor. In many areas, though, the subsidence has been hidden by fill dirt and bushes. Mr. Guffin stated that there is an artisan well in the vicinity of one corner of the building which may contribute to soil subsidence around the structure.

BUILDING 661 — Communications Center

CPO Brown

This structure houses considerable computer activity. All computer rooms and office spaces have raised tile floors. Where possible, tiles were removed to expose the floor slab below. Some shrinkage cracking of the floor slab was visible. There are no visible expansion joints in the building. The only soil subsidence problem noticed is the settling of the loading dock with respect to the building. This has caused the dock to separate slightly from the building exterior. There is no effect on the building interior, however.

BUILDING 665 — Package Store

This building was formerly the base package store, but is presently unoccupied. All floor area is carpeted and there is no visible evidence of severe cracking of the underlying floor slab. There is only one restroom, and all plumbing appears to be well sealed. There is considerable soil subsidence around the perimeter of the building, allowing air to flow freely beneath the building.

BUILDING 666 — Credit Union

All floor space in the credit union is either carpeted or tiled. There is no visible evidence of cracking of the underlying slab. The plumbing connections in the restrooms appear to be well sealed. Soil subsidence along the north face of the building has caused the asphalt driveway to settle away from the grade beams. This has created an opening below the grade beams which allows air to flow underneath the structure.

BUILDINGS 668 and 669 — Barracks

PO Hayes 743-5268

The majority of the floor area of these identical buildings is private quarters which are carpeted or tiled. There is no visible evidence of cracking of the underlying slab in either building. There are mechanical rooms in each building which have exposed slabs, but no shrinkage cracking is visible. There have been no additions to either structure and there are no visible expansion joints. The only soil subsidence problem is on the west end of Building 669. Here, the original soil has settled away from the structure. Fill dirt has been added to cover the opening which was made, but this fill has also begun to settle. This has opened a crack between the building and the soil allowing air to flow underneath the structure.

BUILDING 670 — Racquet and Fitness Center

The original fitness center building was constructed in approximately 1984. The original structure consisted of what is today the main entrance lobby, front desk, weight room, aerobics area, and the forward locker rooms and hot tub. The racquetball courts were added in approximately 1989. Since this is recent construction, the construction joint between the sections is still in excellent condition. The majority of floor space is covered by carpet, tile, or hardwood flooring and there is no visible evidence to indicate severe cracking of the underlying floor slab. The only areas with an exposed concrete floor are the maintenance and janitorial closets. Some minor shrinkage cracking is visible in these rooms. The majority of plumbing enters rooms through the walls and appears to be well sealed. There is some piping which extends through the floor slab that appears to be well sealed also. The only noticeable soil subsidence occurs in three small locations along the east wall of the newest building. Two of the three locations occur directly below downspouts for the roof drainage.

BUILDING 672 — Fleet Training Facility

Chief Rose

This structure was commissioned in 1986 and has had no additions. There are no visible expansion joints in the building. The majority of the floor space is carpeted or tiled and there is no visible evidence of severe cracking of the underlying floor slab. There is a maintenance bay on the north end of the building which has an exposed concrete floor. There was no formed control joint in the slab, but no shrinkage cracks are visible yet. The only plumbing connections are in the two bathrooms and in two closets. All appear to be well sealed. There are no soil subsidence problems visible around the exterior perimeter of the structure.

BUILDING 673 — NCTSI Facility

This structure appears to be of the same construction period as Building 672. There are no visible expansion joints in the building. Most floor areas are tiled or carpeted and there is no visible evidence of cracking of the underlying slab. All plumbing connections appear to be well sealed. There are no visible soil subsidence problems around the exterior perimeter of the structure.

BUILDING 675 — Dental Clinic

All floor space is carpeted or tiled and there is no evidence of severe cracking of the underlying slab. There have been no additions to the building and there are no visible expansion joints. All plumbing appears to be well sealed. There are no soil subsidence problems visible around the perimeter of the building.

BUILDINGS 676 and 677 — Quarters

These buildings are identical structures which have carpeted rooms and hallways and tiled bathrooms. There is no visible evidence of severe cracking of the underlying floor slab in either building. All plumbing appears to be well sealed. There have been no additions to either building and there are no visible expansion joints. The only visible soil subsidence occurs around the stairwells of each building.

BUILDING 686 — SUBTRAFAC Operational Training Facility

Ross Cummings 743-2893

There have been no additions made to the original structure, and there are no visible expansion joints in the building. All floor space is either carpeted or tiled, and there is no evidence of severe cracking in the underlying floor slab. All visible piping for restrooms, etc. enters through the walls and appears to be well sealed. There are no visible soil subsidence problems around the exterior perimeter of the building.

BUILDING 1347 — Tool Room

The entire floor is exposed in this building, with formed control joints appearing at approximately 20 foot intervals. There is some other minor shrinkage cracking visible. There is some soil subsidence around the exterior perimeter, but no settling below the grade beams has occurred.

BUILDING 1447 — Bath House

Tony Folk 743-5085

This is a relatively small building that has had no additions. The only noticeable shrinkage cracking is in the men's locker room just outside the showers. There is a control joint in the slab through the center of the building which is still well sealed. However, there are several locations around the interior perimeter of the slab where the slab does not appear to be well sealed to the wall. The piping for the sinks is not sealed entering the walls. There are no noticeable soil subsidence problems around the exterior perimeter of the building.

BUILDING 1776 — CBU 412 Shop

Chief Rudat

This structure contains two separate areas: an auto shop and the UT/CE/BU shop. In the auto shop area, there is no visible shrinkage cracking of the concrete. The control joints appear to be well sealed. However, there is significant cracking of the floor slab in the UT/CE/BU shop. In one area of the floor, the crack follows a straight line in one direction and makes a ninety degree turn to form a corner, as if it were outlining a separate section of slab. The remainder of the crack follows a completely irregular pattern. The floor is painted in such a way that it conceals any formed joints that may be present. There is no visible plumbing in either area. There are no visible soil subsidence problems around the exterior of the structure.

BUILDING 1778 — CBU 412 Classroom

Chief Rudat

This building contains a large open room used for instruction and a small kitchen on the south end which is used as a break room. All floor space is tiled. There is a large crack in the floor tile across the center of the classroom. The crack does not follow a regular pattern (such as the straight line of an expansion joint). The crack indicates severe structural cracking of the underlying slab. No other cracking is visible. The only plumbing connections are for a sink, and they appear to be well sealed. There is no visible soil subsidence around the exterior of the structure.

BUILDINGS 1880, 1881, and 1882 — CBU 412 Storage

Chief Rudat

These three storage buildings are actually joined together to form one large storage area. Each of the three buildings is a pre-engineered metal "Butler" building. The buildings appear to have been constructed at the same time, but Chief Rudat did not know for certain. The buildings were constructed adjacent to each other, with 1880 being in the center. The walls where two adjacent buildings meet were not erected, thus creating open access inside between all three buildings. The floor slab appears to have been poured in a single pour with no formed control joints. Two large shrinkage cracks are visible across the width of the floor along the lines where Building 1880 meets Buildings 1881 and 1882. There is no plumbing in the buildings. There are no visible soil subsidence problems around the exterior perimeter of the structure.

BUILDINGS 1883 AND 1892 — CBU 412 Storage with office space

Chief Rudat

All floor area in the two buildings is tiled or carpeted. There was no visible evidence of severe cracking of the underlying slab in either building. There is no plumbing entering either structure. There are no visible soil subsidence problems around the exterior perimeter of either building.

BUILDING 1884 — CBU 412 Shop

Chief Rudat

This is a relatively new structure which does not appear on the base map or building list. The floor slab is in excellent condition, with no visible shrinkage cracking and well sealed control joints. The structure is a typical pre-engineered metal "Butler" building with no insulation. The base of the sheet metal siding is not sealed to the floor, which allows air to flow into the structure. There are no visible soil subsidence problems around the perimeter of the structure.

BUILDINGS 1885 and 1777 — CBU 412 Administration

Chief Rudat

These two building were once separate structures containing 4 to 6 offices each. They have been joined by a small enclosed lobby area. There have been no other expansions to the structures. At one of the construction joints between an original building and the lobby, there is a small recess in the tile floor but no cracking. This indicates that there may be differential settlement which is causing the construction joint to separate. All floor space is carpeted or tiled. There is no other evidence of severe cracking of the floor slab. There are no visible soil subsidence problems around the exterior of the buildings.

BUILDING 1886 — CBU 412 Washrooms

Chief Rudat

This building is a former storage building which has been remodeled into men's and women's restrooms, showers, and changing areas. All floor space is tiled and there is no evidence of cracking of the underlying slab. All plumbing appears to be well sealed. There is no visible soil subsidence around the perimeter. However, there is considerable vertical cracking of the grade beam on the west face.

BUILDINGS 1984 — Pistol Range Classroom and 1889 — Indoor Pistol Range
These buildings were constructed in approximately 1983 and there have been no additions to either structure. The classroom floor is carpeted and there is no visible evidence of severe cracking of the underlying slab. The pistol range floor is completely exposed. Shrinkage cracks extend across the short direction of the building at approximately 10 foot intervals. There are no noticeable soil subsidence problems around the exterior perimeter of either building.

BUILDINGS SURVEYED			
Building Number	**Description**	**Date Surveyed**	**Surveyor**
X25	Laundromat	1/28/94	BED, KAM
NS31	Disciplinary & Transient	1/26/94	BED, KAM
	Personnel Barracks	1/26/94	BED, KAM
NS32	Transient Personnel	1/26/94	BED, KAM
33	Barracks	1/26/94	BED, KAM
34	Barracks	1/26/94	BED, KAM
NS35	Barracks	1/26/94	BED, KAM
36	Barracks	1/26/94	BED, KAM
37	Barracks	1/26/94	BED, KAM
NS43	Dining Hall	1/26/94	BED, KAM
NS46	NAVSTA HQ	1/26/94	MEA, KAM
NS53	Barber Shop, Storage	1/27/94	KAM
NS54	Billeting Office	1/28/94	BED, KAM
FBM61	FBM Sub Training Center	1/26/94	MEA
65	Barracks	1/25/94	BED, KAM
NS66	Barracks	1/25/94	BED, KAM
NS67	Barracks	1/25/94	BED, KAM
NS71	Cafeteria	1/25/94	BED, KAM
NS79	Dispensary	1/27/94	BED, KAM
NS84	Naval Security Group	1/27/94	KAM
202	Fleet & Mine Warfare Instruction	1/28/94	BED, KAM
623	Garden Shop	1/25/94	ALL
636	Auto Hobby Shop	1/27/94	BED, KAM
638	Bath House	2/1/94	MEA
640	Steamers (CPO Club)	1/27/94	BED, KAM
642	McDonalds	1/28/94	KAM

BUILDINGS SURVEYED			
Building Number	Description	Date Surveyed	Surveyor
643	Fleet & Mine Warfare Training	1/31/94	MEA, BED
644	Bowling Center	1/27/94	BED; KAM
645	Fleet & Mine Warfare		
	Engine Overhall Facility	1/31/94	MEA, BED
646	Admin. and Training COMSUBGRU 6	1/31/94	MEA, BED
647	Fleet & Mine Warfare Training	1/31/94	MEA, BED
648	Supply Depot	1/31/94	BED, KAM
649	Fleet & Mine Warfare Training	1/31/94	MEA, BED
650	Post Office	1/26/94	BED, KAM
652	EM Quarters	1/25/94	BED, KAM
653	Barracks	1/25/94	BED, KAM
654	Personnel Support Detachment	1/26/94	MEA, KAM
655	Commissary	1/25/94	ALL
656	Exchange	1/25/94	ALL
657	Sports Bar	1/25/94	ALL
661	Communications Center	1/26/94	BED, KAM
665	Former Package Store	1/25/94	ALL
666	Credit Union	1/28/94	KAM
668	BEQ	1/25/94	ALL
669	BEQ	1/25/94	ALL
670	Raquet & Fitness Center	1/26/94	MEA, KAM
672	Fleet Training Facility	1/28/94	MEA, KAM
673	NCTSI Facility	1/28/94	MEA, KAM
675	Dental Clinic	1/26/94	BED, KAM

BUILDINGS SURVEYED			
Building Number	**Description**	**Date Surveyed**	**Surveyor**
676	Barracks	1/26/94	BED, KAM
677	Barracks	1/26/94	BED, KAM
686	SUBTRAFAC Operational Training	1/26/94	MEA
1347	Auto Hobby Shop	1/27/94	BED, KAM
1447	Bath House	2/1/94	MEA
1493	Auto Hobby Shop	1/27/94	BED, KAM
1776	CBU 412 Shop	1/27/94	MEA, BED
1777	CBU 412 Administration	1/27/94	MEA, BED
1778	CBU 412 Storage	1/27/94	MEA, BED
1880	CBU 412 Paint Locker	1/27/94	MEA, BED
1881	CBU 412 Storage	1/27/94	MEA, BED
1882	CBU 412 Storage	1/27/94	MEA, BED
1883	CBU 412 Storage	1/27/94	MEA, BED
1884	CBU 412 Shop	1/27/94	MEA, BED
1885	CBU 412 Administration	1/27/94	MEA, BED
1886	CBU 412 Storage	1/27/94	MEA, BED
1888	Indoor Pistol Range	1/27/94	KAM
1892	CBU 412 Supply Storage	1/27/94	MEA, BED
1984	Pistol Range Classroom	1/27/94	KAM

Appendix B
Validated Analytical Data

	SAMPLE ID ------->	012-A-F410-F2		036-A-1101-F2		036-A-1102-F2		036-A-1203-F2		036-A-1204-F2		036-A-1305-F2	
	ORIGINAL ID ----->	012AF410F2		036A1101F2		036A1102F2		036A1203F2		036A1204F2		036A1305F2	
	LAB SAMPLE ID --->	9411343-10		9412075-01		9412075-02		9412075-03		9412075-04		9412075-05	
	ID FROM REPORT -->	012AF410F2		036A1101F2		036A1102F2		036A1203F2		036A1204F2		036A1305F2	
	SAMPLE DATE ----->	11/15/94		12/01/94		12/01/94		12/01/94		12/01/94		12/01/94	
	DATE EXTRACTED -->												
	DATE ANALYZED --->	11/18/94		12/06/94		12/06/94		12/06/94		12/06/94		12/07/94	
	MATRIX ---------->	A		A		A		A		A		A	
	UNITS ----------->	ppbv		ppbv		ppbv		ppbv		ppbv		ppbv	
Method	Parameter	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL
TO-14	1,1,1-Trichloroethane	1.	U	1.	U	0.53	J	0.5	J	0.53	J	0.58	J
TO-14	1,1,2,2-Tetrachloroethane	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,1,2-Trichloroethane	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,1-Dichloroethane	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,1-Dichloroethene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,2,4-Trichlorobenzene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Benzene, 1,2,4-trimethyl	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Ethylene dibromide	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,2-Dichlorobenzene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,2-Dichloroethane	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,2-Dichloropropane	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,2-Dichlorotetrafluoroethane	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	cis-1,2-Dichloroethylene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Benzene, 1,3,5-trimethyl-	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,3-Dichlorobenzene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,4-Dichlorobenzene	0.7	J	1.	U	6.31		1.49		1.21		1.25	
TO-14	p-Ethyltoluene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Allyl chloride	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Benzene	0.21	J	0.27	J	1.	U	1.	U	1.	U	1.	U
TO-14	Benzyl chloride	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Carbon tetrachloride	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Chlorobenzene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Chloroethane	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Chloroform	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Dichlorodifluoromethane	1.	U	0.32	J	0.44	J	0.36	J	0.35	J	0.36	J
TO-14	Ethylbenzene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Hexachlorobutadiene	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Bromomethane	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Chloromethane	1.	U	0.28	J	0.31	J	0.23	J	0.23	J	1.	U
TO-14	Methylene chloride	0.35	J	0.29	U	0.6	U	0.24	U	0.29	U	0.39	U
TO-14	Styrene	0.93	J	0.41	J	1.	R	1.	R	1.	R	1.	R
TO-14	Tetrachloroethene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Toluene	1.	U	0.39	J	0.35	J	1.	U	0.27	J	1.	U
TO-14	Trichloroethene	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Trichlorofluoromethane	1.	U	0.62	J	0.74	J	0.37	J	0.34	J	0.37	J
TO-14	Trichlorotrifluoroethane (Freon 113)	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U

	SAMPLE ID -------->	012-A-F410-F2		036-A-1101-F2		036-A-1102-F2		036-A-1203-F2		036-A-1204-F2		036-A-1305-F2	
	ORIGINAL ID ------>	012AF410F2		036A1101F2		036A1102F2		036A1203F2		036A1204F2		036A1305F2	
	LAB SAMPLE ID --->	9411343-10		9412075-01		9412075-02		9412075-03		9412075-04		9412075-05	
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	SAMPLE DATE ----->	11/15/94		12/01/94		12/01/94		12/01/94		12/01/94		12/01/94	
	DATE EXTRACTED -->												
	DATE ANALYZED --->	11/18/94		12/06/94		12/06/94		12/06/94		12/06/94		12/07/94	
	MATRIX ---------->	A		A		A		A		A		A	
	UNITS ----------->	ppbv		ppbv		ppbv		ppbv		ppbv		ppbv	
Method	Parameter	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL
TO-14	Vinyl chloride	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	cis-1,3-Dichloropropene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	m+p-Xylenes	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	o-Xylene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	trans-1,3-Dichloropropene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U

CHARLESTON - ZONE H
CHARLESTON ZONE H-AIR SAMPLES ONLY

	SAMPLE ID ------->	036-A-1306-F2		036-A-2101-F2		036-A-2102-F2		036-A-2103-F2		036-A-2204-F2		036-A-2305-F2	
	ORIGINAL ID ----->	036A1306F2		036A2101F2		036A2102F2		036A2103F2		036A2204F2		036A2305F2	
	LAB SAMPLE ID --->	9412075-06		9412076-01		9412076-02		9412076-03		9412076-04		9412076-05	
	ID FROM REPORT -->	036A1306F2		036A2101F2		036A2102F2		036A2103F2		036A2204F2		036A2305F2	
	SAMPLE DATE ----->	12/01/94		12/02/94		12/02/94		12/02/94		12/02/94		12/02/94	
	DATE EXTRACTED -->												
	DATE ANALYZED --->	12/07/94		12/06/94		12/06/94		12/06/94		12/06/94		12/08/94	
	MATRIX ---------->	A		A		A		A		A		A	
	UNITS ----------->	ppbv		ppbv		ppbv		ppbv		ppbv		ppbv	
Method	Parameter	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL
TO-14	1,1,1-Trichloroethane	1.	U	1.	U	1.	U	1.	UJ	1.	U	1.	U
TO-14	1,1,2,2-Tetrachloroethane	1.	U	1.	U	1.	U	1.	UJ	1.	U	1.	U
TO-14	1,1,2-Trichloroethane	1.	U	1.	U	1.	U	1.	UJ	1.	U	1.	U
TO-14	1,1-Dichloroethane	1.	U	1.	U	1.	U	1.	UJ	1.	U	1.	U
TO-14	1,1-Dichloroethene	1.	U	1.	U	1.	U	1.	UJ	1.	U	1.	U
TO-14	1,2,4-Trichlorobenzene	1.	U	1.	U	1.	U	1.	UJ	1.	U	1.	U
TO-14	Benzene, 1,2,4-trimethyl	1.	U	1.	U	1.	U	1.	UJ	1.	U	1.	U
TO-14	Ethylene dibromide	1.	U	1.	U	1.	U	1.	UJ	1.	U	1.	U
TO-14	1,2-Dichlorobenzene	1.	U	1.	U	1.	U	1.	UJ	1.	U	1.	U
TO-14	1,2-Dichloroethane	1.	U	1.	U	1.	U	1.	UJ	1.	U	1.	U
TO-14	1,2-Dichloropropane	1.	U	1.	U	1.	U	1.	UJ	1.	U	1.	U
TO-14	1,2-Dichlorotetrafluoroethane	1.	U	1.	U	1.	U	1.	UJ	1.	U	1.	U
TO-14	cis-1,2-Dichloroethylene	1.	U	1.	U	1.	U	1.	UJ	1.	U	1.	U
TO-14	Benzene, 1,3,5-trimethyl-	1.	U	1.	U	1.	U	1.	UJ	1.	U	1.	U
TO-14	1,3-Dichlorobenzene	1.	U	1.	U	1.	U	1.	UJ	1.	U	1.	U
TO-14	1,4-Dichlorobenzene	0.69	J	1.	U	65.6		54.9	J	6.76		0.95	J
TO-14	p-Ethyltoluene	1.	U	1.	U	1.	U	1.	UJ	1.	U	1.	U
TO-14	Allyl chloride	1.	U	1.	U	1.	U	1.	UJ	1.	U	1.	U
TO-14	Benzene	0.22	J	0.22	J	0.21	J	0.21	J	1.	U	1.	U
TO-14	Benzyl chloride	1.	U	1.	U	1.	U	1.	UJ	1.	U	1.	U
TO-14	Carbon tetrachloride	1.	U	1.	U	1.	U	1.	UJ	1.	U	1.	U
TO-14	Chlorobenzene	1.	U	1.	U	1.	U	1.	UJ	1.	U	1.	U
TO-14	Chloroethane	1.	U	1.	U	1.	U	1.	UJ	1.	U	1.	U
TO-14	Chloroform	1.	U	1.	U	1.	U	1.	UJ	0.33	J	0.39	J
TO-14	Dichlorodifluoromethane	0.34	J	0.37	J	2.87		2.43	J	0.82	J	0.64	J
TO-14	Ethylbenzene	1.	U	1.	U	1.	U	1.	UJ	1.	U	1.	U
TO-14	Hexachlorobutadiene	1.	U	1.	U	1.	U	1.	UJ	1.	U	1.	U
TO-14	Bromomethane	1.	U	1.	U	1.	U	1.	UJ	1.	U	1.	U
TO-14	Chloromethane	0.28	J	0.3	J	0.37	J	0.36	J	0.24	J	0.24	J
TO-14	Methylene chloride	0.22	U	0.68	J	0.47	J	0.68	J	0.28	J	0.98	J
TO-14	Styrene	1.	R	1.	R	0.41	J	1.	R	1.	R	1.	R
TO-14	Tetrachloroethene	1.	U	1.	U	1.	U	1.	UJ	1.	U	1.	U
TO-14	Toluene	0.27	J	0.4	J	0.47	J	0.41	J	0.2	J	0.34	J
TO-14	Trichloroethene	1.	U	1.	U	1.	U	1.	UJ	1.	U	1.	U
TO-14	Trichlorofluoromethane	0.34	J	0.41	J	2.79		2.01	J	0.63	J	0.79	J
TO-14	Trichlorotrifluoroethane (Freon 113)	1.	U	1.	U	1.	U	1.	UJ	1.	U	1.	U

CHARLESTON - ZONE H
CHARLESTON ZONE H-AIR SAMPLES ONLY

	SAMPLE ID ------->	036-A-1306-F2		036-A-2101-F2		036-A-2102-F2		036-A-2103-F2		036-A-2204-F2		036-A-2305-F2	
	ORIGINAL ID ----->	036A1306F2		036A2101F2		036A2102F2		036A2103F2		036A2204F2		036A2305F2	
	LAB SAMPLE ID --->	9412075-06		9412076-01		9412076-02		9412076-03		9412076-04		9412076-05	
	ID FROM REPORT -->	036A1306F2		036A2101F2		036A2102F2		036A2103F2		036A2204F2		036A2305F2	
	SAMPLE DATE ----->	12/01/94		12/02/94		12/02/94		12/02/94		12/02/94		12/02/94	
	DATE EXTRACTED -->												
	DATE ANALYZED --->	12/07/94		12/06/94		12/06/94		12/06/94		12/06/94		12/08/94	
	MATRIX ---------->	A		A		A		A		A		A	
	UNITS ----------->	ppbv		ppbv		ppbv		ppbv		ppbv		ppbv	
Method	Parameter	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL
TO-14	Vinyl chloride	1.	U	1.	U	1.	U	1.	UJ	1.	U	1.	U
TO-14	cis-1,3-Dichloropropene	1.	U	1.	U	1.	U	1.	UJ	1.	U	1.	U
TO-14	m+p-Xylenes	1.	U	0.32	J	1.	U	1.	UJ	1.	U	1.	U
TO-14	o-Xylene	1.	U	1.	U	1.	U	1.	UJ	1.	U	1.	U
TO-14	trans-1,3-Dichloropropene	1.	U	1.	U	1.	U	1.	UJ	1.	U	1.	U

CHARLESTON - ZONE H
CHARLESTON ZONE H-AIR SAMPLES ONLY

	SAMPLE ID ------->	036-A-2306-F2		036-A-3101-F2		036-A-3102-F2		036-A-3203-F2		036-A-3304-F2		036-A-3305-F2	
	ORIGINAL ID ----->	036A2306F2		036A3101F2		036A3102F2		036A3203F2		036A3304F2		036A3305F2	
	LAB SAMPLE ID --->	9412076-06		9412077-01		9412077-02		9412077-03		9412077-04		9412077-05	
	ID FROM REPORT -->	036A2306F2		036A3101F2		036A3102F2		036A3203F2		036A3304F2		036A3305F2	
	SAMPLE DATE ----->	12/02/94		12/05/94		12/05/94		12/05/94		12/05/94		12/05/94	
	DATE EXTRACTED -->												
	DATE ANALYZED --->	12/08/94		12/07/94		12/07/94		12/07/94		12/07/94		12/07/94	
	MATRIX ---------->	A		A		A		A		A		A	
	UNITS ----------->	ppbv		ppbv		ppbv		ppbv		ppbv		ppbv	
Method	Parameter	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL
TO-14	1,1,1-Trichloroethane	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,1,2,2-Tetrachloroethane	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,1,2-Trichloroethane	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,1-Dichloroethane	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,1-Dichloroethene	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,2,4-Trichlorobenzene	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Benzene, 1,2,4-trimethyl	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Ethylene dibromide	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,2-Dichlorobenzene	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,2-Dichloroethane	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,2-Dichloropropane	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,2-Dichlorotetrafluoroethane	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	cis-1,2-Dichloroethylene	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Benzene, 1,3,5-trimethyl-	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,3-Dichlorobenzene	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,4-Dichlorobenzene	0.56	J	1.	U	4.86		2.22		1.08		1.63	
TO-14	p-Ethyltoluene	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Allyl chloride	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Benzene	1.	UJ	0.25	J	1.	U	1.	U	1.	U	1.	U
TO-14	Benzyl chloride	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Carbon tetrachloride	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Chlorobenzene	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Chloroethane	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Chloroform	1.31	J	1.	U	1.	U	0.56	J	0.94	J	3.55	
TO-14	Dichlorodifluoromethane	0.44	J	0.39	J	0.48	J	0.41	J	0.4	J	0.37	J
TO-14	Ethylbenzene	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Hexachlorobutadiene	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Bromomethane	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Chloromethane	1.	UJ	0.42	J	0.53	J	0.33	J	0.26	J	0.27	J
TO-14	Methylene chloride	0.23	J	0.32	J	0.51	J	0.26	J	2.1		0.28	J
TO-14	Styrene	1.	R	1.	R	1.	R	1.	R	1.	R	1.	R
TO-14	Tetrachloroethene	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Toluene	1.	UJ	0.57	J	0.44	J	0.27	J	0.39	J	1.	U
TO-14	Trichloroethene	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Trichlorofluoromethane	0.43	J	0.44	J	1.05		0.64	J	0.88	J	0.61	J
TO-14	Trichlorotrifluoroethane (Freon 113)	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U

CHARLESTON - ZONE H
CHARLESTON ZONE H-AIR SAMPLES ONLY

	SAMPLE ID ------->	036-A-2306-F2		036-A-3101-F2		036-A-3102-F2		036-A-3203-F2		036-A-3304-F2		036-A-3305-F2	
	ORIGINAL ID ----->	036A2306F2		036A3101F2		036A3102F2		036A3203F2		036A3304F2		036A3305F2	
	LAB SAMPLE ID --->	9412076-06		9412077-01		9412077-02		9412077-03		9412077-04		9412077-05	
	ID FROM REPORT -->	036A2306F2		036A3101F2		036A3102F2		036A3203F2		036A3304F2		036A3305F2	
	SAMPLE DATE ----->	12/02/94		12/05/94		12/05/94		12/05/94		12/05/94		12/05/94	
	DATE EXTRACTED -->												
	DATE ANALYZED --->	12/08/94		12/07/94		12/07/94		12/07/94		12/07/94		12/07/94	
	MATRIX ---------->	A		A		A		A		A		A	
	UNITS ----------->	ppbv		ppbv		ppbv		ppbv		ppbv		ppbv	
Method	Parameter	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL
TO-14	Vinyl chloride	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	cis-1,3-Dichloropropene	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	m+p-Xylenes	1.	UJ	0.6	J	0.37	J	0.23	J	0.39	J	1.	U
TO-14	o-Xylene	1.	UJ	0.19	J	1.	U	1.	U	1.	U	1.	U
TO-14	trans-1,3-Dichloropropene	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U

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CHARLESTON - ZONE H
CHARLESTON ZONE H-AIR SAMPLES ONLY

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	SAMPLE ID ------->	12A-A-4009-F2		202-A-1101-F2		202-A-1202-F2		202-A-1303-F2		202-A-2101-F2		202-A-2203-F2	
	ORIGINAL ID ----->	12AA4009F2		202A1101F2		202A1202F2		202A1303F2		202A2101F2		202A2203F2	
	LAB SAMPLE ID --->	9411166-09		9411166-01		9411166-02		9411166-03		9411217-10		9411217-12	
	ID FROM REPORT -->	12AA4009F2		202A1101F2		202A1202F2		202A1303F2		202A2101F2		202A2203F2	
	SAMPLE DATE ----->	11/08/94		11/08/94		11/08/94		11/08/94		11/10/94		11/10/94	
	DATE EXTRACTED -->												
	DATE ANALYZED --->	11/10/94		11/09/94		11/09/94		11/09/94		11/12/94		11/14/94	
	MATRIX ---------->	A		A		A		A		A		A	
	UNITS ----------->	ppbv		ppbv		ppbv		ppbv		ppbv		ppbv	
Method	Parameter	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL
TO-14	1,1,1-Trichloroethane	0.55	J	1.	U	2.53	U	0.32	U	0.48	U	0.47	U
TO-14	1,1,2,2-Tetrachloroethane	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,1,2-Trichloroethane	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,1-Dichloroethane	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,1-Dichloroethene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,2,4-Trichlorobenzene	0.71	J	0.29	U	1.	U	1.	U	1.	U	1.	U
TO-14	Benzene, 1,2,4-trimethyl	1.42		0.31	U	1.	U	1.	U	1.03	U	0.42	U
TO-14	Ethylene dibromide	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,2-Dichlorobenzene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,2-Dichloroethane	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,2-Dichloropropane	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,2-Dichlorotetrafluoroethane	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	cis-1,2-Dichloroethylene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Benzene, 1,3,5-trimethyl-	0.45	J	1.	U	1.	U	1.	U	0.31	U	1.	U
TO-14	1,3-Dichlorobenzene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,4-Dichlorobenzene	3.82		5.88	U	9.84	U	0.64	U	9.12	U	9.2	U
TO-14	p-Ethyltoluene	0.91	J	1.	U	1.	U	1.	U	0.68	U	0.28	U
TO-14	Allyl chloride	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Benzene	0.34	J	0.27	U	0.31	U	0.2	U	0.52	U	0.52	U
TO-14	Benzyl chloride	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Carbon tetrachloride	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Chlorobenzene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Chloroethane	1.	U	1.	U	1.	U	1.	U	1.	U	1.	UJ
TO-14	Chloroform	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Dichlorodifluoromethane	0.31	J	1.92		1.26	U	0.46	U	1.59		0.91	U
TO-14	Ethylbenzene	0.35	J	1.	U	1.	U	1.	U	0.33	U	0.24	U
TO-14	Hexachlorobutadiene	0.43	J	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Bromomethane	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Chloromethane	0.42	J	0.46	U	0.53	U	0.36	U	0.62	U	0.56	U
TO-14	Methylene chloride	0.5	J	0.98	U	0.6	U	0.68	U	1.	U	0.37	U
TO-14	Styrene	1.	R	1.	R	1.	R	1.	R	1.	R	1.	R
TO-14	Tetrachloroethene	1.	U	1.	U	1.	U	0.84	J	0.22	J	0.21	J
TO-14	Toluene	1.[illegible]		0.82	U	0.81	U	0.35	U	1.71	U	1.25	U
TO-14	Trichloroethene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Trichlorofluoromethane	0.75	J	5.98		2.92	U	0.46	U	3.47	U	1.28	U
TO-14	Trichlorotrifluoroethane (Freon 113)	1.	U	0.82	J	1.	U	1.	U	0.31	J	1.	U

	SAMPLE ID ------->	12A-A-4009-F2		202-A-1101-F2		202-A-1202-F2		202-A-1303-F2		202-A-2101-F2		202-A-2203-F2	
	ORIGINAL ID ----->	12AA4009F2		202A1101F2		202A1202F2		202A1303F2		202A2101F2		202A2203F2	
	LAB SAMPLE ID --->	9411166-09		9411166-01		9411166-02		9411166-03		9411217-10		9411217-12	
	ID FROM REPORT -->	12AA4009F2		202A1101F2		202A1202F2		202A1303F2		202A2101F2		202A2203F2	
	SAMPLE DATE ----->	11/08/94		11/08/94		11/08/94		11/08/94		11/10/94		11/10/94	
	DATE EXTRACTED -->												
	DATE ANALYZED --->	11/10/94		11/09/94		11/09/94		11/09/94		11/12/94		11/14/94	
	MATRIX ---------->	A		A		A		A		A		A	
	UNITS ----------->	ppbv		ppbv		ppbv		ppbv		ppbv		ppbv	
Method	Parameter	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL
TO-14	Vinyl chloride	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	cis-1,3-Dichloropropene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	m+p-Xylenes	1.53		0.86	U	0.92	U	0.27	U	1.43	U	0.97	U
TO-14	o-Xylene	0.73	J	0.25	U	0.3	U	1.	U	0.54	U	0.36	U
TO-14	trans-1,3-Dichloropropene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U

CHARLESTON - ZONE H
CHARLESTON ZONE H-AIR SAMPLES ONLY

	SAMPLE ID ------->	202-A-2302-F2		202-A-3101-F2		202-A-3202-F2		202-A-3303-F2		202-A-3404-F2		623-A-1108-F2	
	ORIGINAL ID ----->	202A2302F2		202A3101F2		202A3202F2		202A3303F2		202A3404F2		623A1108F2	
	LAB SAMPLE ID --->	9411217-11		9411217-01		9411217-02		9411217-03		9411217-04		9411166-08	
	ID FROM REPORT -->	202A2302F2		202A3101F2		202A3202F2		202A3303F2		202A3404F2		623A1108F2	
	SAMPLE DATE ----->	11/10/94		11/10/94		11/10/94		11/10/94		11/10/94		11/08/94	
	DATE EXTRACTED -->												
	DATE ANALYZED --->	11/15/94		11/12/94		11/12/94		11/12/94		11/12/94		11/10/94	
	MATRIX ---------->	A		A		A		A		A		A	
	UNITS ----------->	ppbv		ppbv		ppbv		ppbv		ppbv		ppbv	
Method	Parameter	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL
TO-14	1,1,1-Trichloroethane	0.21	U	0.74	U	0.44	U	0.24	U	0.4	U	0.21	U
TO-14	1,1,2,2-Tetrachloroethane	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,1,2-Trichloroethane	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,1-Dichloroethane	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,1-Dichloroethene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,2,4-Trichlorobenzene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Benzene, 1,2,4-trimethyl	0.3	U	0.65	U	0.59	U	0.59	U	0.61	U	0.85	U
TO-14	Ethylene dibromide	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,2-Dichlorobenzene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,2-Dichloroethane	1.	U	0.29	J	1.	U	1.	U	1.	U	1.	U
TO-14	1,2-Dichloropropane	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,2-Dichlorotetrafluoroethane	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	cis-1,2-Dichloroethylene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Benzene, 1,3,5-trimethyl-	1.	U	0.22	U	1.	U	1.	U	1.	U	0.26	U
TO-14	1,3-Dichlorobenzene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,4-Dichlorobenzene	0.7	U	5.26	U	3.57	U	0.41	U	5.04	U	1.	U
TO-14	p-Ethyltoluene	0.22	U	0.43	U	0.36	U	0.32	U	0.35	U	0.47	U
TO-14	Allyl chloride	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Benzene	0.39	U	0.69	U	0.81	U	0.77	U	0.82	U	0.26	U
TO-14	Benzyl chloride	1.	U	1.	U	1.	U	1.	U	1.	U	1.	UJ
TO-14	Carbon tetrachloride	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Chlorobenzene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Chloroethane	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Chloroform	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Dichlorodifluoromethane	0.46	U	3.35		1.22	U	0.62	U	1.12	U	0.44	U
TO-14	Ethylbenzene	1.	U	0.37	U	0.27	U	1.	U	0.26	U	1.	U
TO-14	Hexachlorobutadiene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Bromomethane	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Chloromethane	0.41	U	1.47	U	1.17	U	1.04	U	0.94	U	0.41	U
TO-14	Methylene chloride	0.23	U	0.52	U	0.42	U	0.68	U	0.55	U	0.57	U
TO-14	Styrene	1.	R	1.	R	1.	R	1.	R	1.	R	1.	R
TO-14	Tetrachloroethene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Toluene	0.85	U	1.74	U	1.24	U	0.82	U	1.26	U	0.69	U
TO-14	Trichloroethene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Trichlorofluoromethane	0.28	U	10.2		1.74	U	0.52	U	1.63	U	0.4	U
TO-14	Trichlorotrifluoroethane (Freon 113)	1.	U	0.42	J	0.35	J	0.28	J	0.29	J	1.	U

CHARLESTON - ZONE H
CHARLESTON ZONE H-AIR SAMPLES ONLY

	SAMPLE ID -------->	202-A-2302-F2		202-A-3101-F2		202-A-3202-F2		202-A-3303-F2		202-A-3404-F2		623-A-1108-F2	
	ORIGINAL ID ----->	202A2302F2		202A3101F2		202A3202F2		202A3303F2		202A3404F2		623A1108F2	
	LAB SAMPLE ID --->	9411217-11		9411217-01		9411217-02		9411217-03		9411217-04		9411166-08	
	ID FROM REPORT -->	202A2302F2		202A3101F2		202A3202F2		202A3303F2		202A3404F2		623A1108F2	
	SAMPLE DATE ----->	11/10/94		11/10/94		11/10/94		11/10/94		11/10/94		11/08/94	
	DATE EXTRACTED -->												
	DATE ANALYZED --->	11/15/94		11/12/94		11/12/94		11/12/94		11/12/94		11/10/94	
	MATRIX ---------->	A		A		A		A		A		A	
	UNITS ----------->	ppbv		ppbv		ppbv		ppbv		ppbv		ppbv	
Method	Parameter	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL
TO-14	Vinyl chloride	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	cis-1,3-Dichloropropene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	m+p-Xylenes	0.55	U	1.46	U	1.16	U	0.83	U	1.15	U	0.53	U
TO-14	o-Xylene	0.2	U	0.54	U	0.41	U	0.31	U	0.41	U	0.28	U
TO-14	trans-1,3-Dichloropropene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U

	SAMPLE ID ------->	623-A-2109-F2		623-A-3109-F2		623-A-4101-F2		623-A-5101-F2		623-A-6101-F2		623-A-7107-F2	
	ORIGINAL ID ----->	623A2109F2		623A3109F2		623A4101F2		623A5101F2		623A6101F2		623A7107F2	
	LAB SAMPLE ID --->	9411217-18		9411217-09		9411290-09		9411343-01		9411342-01		9411411-07	
	ID FROM REPORT -->	623A2109F2		623A3109F2		623A4101F2		623A5101F2		623A6101F2		623A7107F2	
	SAMPLE DATE ----->	11/09/94		11/10/94		11/14/94		11/16/94		11/16/94		11/18/94	
	DATE EXTRACTED -->												
	DATE ANALYZED --->	11/15/94		11/21/94		11/17/94		11/18/94		11/17/94		11/21/94	
	MATRIX ---------->	A		A		A		A		A		A	
	UNITS ----------->	ppbv		ppbv		ppbv		ppbv		ppbv		ppbv	
Method	Parameter	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL
TO-14	1,1,1-Trichloroethane	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	U
TO-14	1,1,2,2-Tetrachloroethane	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	U
TO-14	1,1,2-Trichloroethane	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	U
TO-14	1,1-Dichloroethane	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	U
TO-14	1,1-Dichloroethene	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	U
TO-14	1,2,4-Trichlorobenzene	1.	U	1.	U	1.	UJ	1.	U	1.	UJ	1.	U
TO-14	Benzene, 1,2,4-trimethyl	0.26	U	1.06	U	1.	U	1.	U	1.	UJ	1.	U
TO-14	Ethylene dibromide	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	U
TO-14	1,2-Dichlorobenzene	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	U
TO-14	1,2-Dichloroethane	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	U
TO-14	1,2-Dichloropropane	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	U
TO-14	1,2-Dichlorotetrafluoroethane	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	U
TO-14	cis-1,2-Dichloroethylene	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	U
TO-14	Benzene, 1,3,5-trimethyl-	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	U
TO-14	1,3-Dichlorobenzene	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	U
TO-14	1,4-Dichlorobenzene	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	U
TO-14	p-Ethyltoluene	0.2	U	0.43	U	1.	U	1.	U	1.	UJ	1.	U
TO-14	Allyl chloride	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	U
TO-14	Benzene	0.34	U	0.38	U	1.	U	0.37	U	1.	UJ	0.32	U
TO-14	Benzyl chloride	1.	U	1.	U	1.	UJ	1.	U	1.	UJ	1.	UJ
TO-14	Carbon tetrachloride	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	U
TO-14	Chlorobenzene	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	U
TO-14	Chloroethane	1.	UJ	1.	UJ	1.	U	1.	U	1.	UJ	1.	U
TO-14	Chloroform	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	U
TO-14	Dichlorodifluoromethane	0.36	U	0.36	U	0.31	J	0.25	J	0.3	J	0.25	J
TO-14	Ethylbenzene	1.	U	0.38	U	1.	U	1.	U	1.	UJ	1.	U
TO-14	Hexachlorobutadiene	1.	U	1.	U	1.	UJ	1.	UJ	1.	UJ	1.	UJ
TO-14	Bromomethane	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	U
TO-14	Chloromethane	0.39	U	0.59	U	0.31	J	0.38	J	0.48	J	0.28	U
TO-14	Methylene chloride	0.25	U	0.55	U	0.24	U	0.33	U	1.85	UJ	0.28	U
TO-14	Styrene	1.	R	1.	R	1.	R	1.	R	1.28	R	1.	R
TO-14	Tetrachloroethene	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	U
TO-14	Toluene	0.79	U	2.84	U	0.3	J	0.27	J	1.12	J	0.56	J
TO-14	Trichloroethene	1.	U	1.	U	1.	U	1.	UJ	1.	UJ	1.	U
TO-14	Trichlorofluoromethane	1.	U	0.65	U	0.47	J	0.66	J	0.91	J	1.	U
TO-14	Trichlorotrifluoroethane (Freon 113)	1.	U	1.	U	0.25	J	1.	U	1.	UJ	1.	U

CHARLESTON - ZONE H
CHARLESTON ZONE H-AIR SAMPLES ONLY

	SAMPLE ID -------->	623-A-2109-F2		623-A-3109-F2		623-A-4101-F2		623-A-5101-F2		623-A-6101-F2		623-A-7107-F2	
	ORIGINAL ID ----->	623A2109F2		623A3109F2		623A4101F2		623A5101F2		623A6101F2		623A7107F2	
	LAB SAMPLE ID --->	9411217-18		9411217-09		9411290-09		9411343-01		9411342-01		9411411-07	
	ID FROM REPORT -->	623A2109F2		623A3109F2		623A4101F2		623A5101F2		623A6101F2		623A7107F2	
	SAMPLE DATE ----->	11/09/94		11/10/94		11/14/94		11/16/94		11/16/94		11/18/94	
	DATE EXTRACTED -->												
	DATE ANALYZED --->	11/15/94		11/21/94		11/17/94		11/18/94		11/17/94		11/21/94	
	MATRIX ---------->	A		A		A		A		A		A	
	UNITS ----------->	ppbv		ppbv		ppbv		ppbv		ppbv		ppbv	
Method	Parameter	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL
TO-14	Vinyl chloride	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	U
TO-14	cis-1,3-Dichloropropene	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	U
TO-14	m+p-Xylenes	0.54	U	1.	U	1.	U	1.	U	1.	UJ	0.39	J
TO-14	o-Xylene	0.2	U	5.97		1.	U	1.	U	1.	UJ	1.	U
TO-14	trans-1,3-Dichloropropene	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	U

	SAMPLE ID ------->	623-A-8101-F2		623-A-9101-F2		624-A-4101-F2		624-A-5101-F2		624-A-6101-F2		643-A-1102-F2	
	ORIGINAL ID ----->	623A8101F2		623A9101F2		624A4101F2		624A5101F2		624A6101F2		643A1102F2	
	LAB SAMPLE ID --->	9411538-01		9411567-01		9412184-01		9412185-01		9412186-01		9411290-02	
	ID FROM REPORT -->	623A8101F2		623A9101F2		624A4101F2		624A5101F2		624A6101F2		643A1102F2	
	SAMPLE DATE ----->	11/29/94		11/30/94		12/06/94		12/07/94		12/08/94		11/14/94	
	DATE EXTRACTED -->												
	DATE ANALYZED --->	12/01/94		12/02/94		12/13/94		12/13/94		12/14/94		11/17/94	
	MATRIX ---------->	A		A		A		A		A		A	
	UNITS ----------->	ppbv		ppbv		ppbv		ppbv		ppbv		ppbv	
Method	Parameter	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL
TO-14	1,1,1-Trichloroethane	1.	U	1.	U	1.	U	1.	U	0.2	J	2.03	
TO-14	1,1,2,2-Tetrachloroethane	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	U
TO-14	1,1,2-Trichloroethane	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	U
TO-14	1,1-Dichloroethane	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	U
TO-14	1,1-Dichloroethene	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	U
TO-14	1,2,4-Trichlorobenzene	0.2	U	1.	U	1.	U	1.	U	1.	UJ	0.35	J
TO-14	Benzene, 1,2,4-trimethyl	1.	U	1.	U	1.	U	1.	U	1.	UJ	0.36	J
TO-14	Ethylene dibromide	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	U
TO-14	1,2-Dichlorobenzene	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	U
TO-14	1,2-Dichloroethane	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	U
TO-14	1,2-Dichloropropane	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	U
TO-14	1,2-Dichlorotetrafluoroethane	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	U
TO-14	cis-1,2-Dichloroethylene	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	U
TO-14	Benzene, 1,3,5-trimethyl-	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	U
TO-14	1,3-Dichlorobenzene	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	U
TO-14	1,4-Dichlorobenzene	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	U
TO-14	p-Ethyltoluene	1.	U	1.	U	1.	U	1.	U	1.	UJ	0.27	J
TO-14	Allyl chloride	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	U
TO-14	Benzene	0.23	J	0.27	J	0.32	J	0.31	J	1.	UJ	0.25	U
TO-14	Benzyl chloride	1.	U	1.	U	1.	U	1.	U	1.	UJ	0.53	J
TO-14	Carbon tetrachloride	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	U
TO-14	Chlorobenzene	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	U
TO-14	Chloroethane	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	U
TO-14	Chloroform	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	U
TO-14	Dichlorodifluoromethane	0.37	J	0.4	J	0.45	J	0.58	J	0.37	J	4.77	
TO-14	Ethylbenzene	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	U
TO-14	Hexachlorobutadiene	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	UJ
TO-14	Bromomethane	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	U
TO-14	Chloromethane	0.37	J	0.37	J	0.47	J	0.32	J	0.31	J	0.37	J
TO-14	Methylene chloride	0.37	U	0.54	U	0.36	J	0.25	J	0.25	J	0.27	U
TO-14	Styrene	1.	R	1.	R	1.	R	1.	R	1.	R	4.44	R
TO-14	Tetrachloroethene	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	U
TO-14	Toluene	0.34	J	0.53	J	0.61	J	0.93	J	0.28	J	0.42	J
TO-14	Trichloroethene	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	U
TO-14	Trichlorofluoromethane	0.37	J	0.27	J	0.53	J	0.43	J	0.47	J	8.29	
TO-14	Trichlorotrifluoroethane (Freon 113)	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	U

	SAMPLE ID ------->	623-A-8101-F2		623-A-9101-F2		624-A-4101-F2		624-A-5101-F2		624-A-6101-F2		643-A-1102-F2	
	ORIGINAL ID ----->	623A8101F2		623A9101F2		624A4101F2		624A5101F2		624A6101F2		643A1102F2	
	LAB SAMPLE ID --->	9411538-01		9411567-01		9412184-01		9412185-01		9412186-01		9411290-02	
	ID FROM REPORT -->	623A8101F2		623A9101F2		624A4101F2		624A5101F2		624A6101F2		643A1102F2	
	SAMPLE DATE ----->	11/29/94		11/30/94		12/06/94		12/07/94		12/08/94		11/14/94	
	DATE EXTRACTED -->												
	DATE ANALYZED --->	12/01/94		12/02/94		12/13/94		12/13/94		12/14/94		11/17/94	
	MATRIX ---------->	A		A		A		A		A		A	
	UNITS ----------->	ppbv		ppbv		ppbv		ppbv		ppbv		ppbv	
Method	Parameter	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL
TO-14	Vinyl chloride	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	U
TO-14	cis-1,3-Dichloropropene	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	U
TO-14	m+p-Xylenes	0.23	J	0.2	J	0.4	J	0.42	J	1.	UJ	0.25	J
TO-14	o-Xylene	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	U
TO-14	trans-1,3-Dichloropropene	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	U

	SAMPLE ID ------->	643-A-1203-F2		643-A-1304-F2		643-A-1305-F2		643-A-2103-F2		643-A-2204-F2		643-A-2302-F2	
	ORIGINAL ID ----->	643A1203F2		643A1304F2		643A1305F2		643A2103F2		643A2204F2		643A2302F2	
	LAB SAMPLE ID --->	9411290-01		9411290-03		9411290-04		9411343-03		9411343-04		9411343-02	
	ID FROM REPORT -->	643A1203F2		643A1304F2		643A1305F2		643A2103F2		643A2204F2		643A2302F2	
	SAMPLE DATE ----->	11/14/94		11/14/94		11/14/94		11/15/94		11/15/94		11/16/94	
	DATE EXTRACTED -->												
	DATE ANALYZED --->	11/17/94		11/17/94		11/17/94		11/18/94		11/18/94		11/18/94	
	MATRIX ---------->	A		A		A		A		A		A	
	UNITS ----------->	ppbv		ppbv		ppbv		ppbv		ppbv		ppbv	
Method	Parameter	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL
TO-14	1,1,1-Trichloroethane	2.17		2.23		1.	U	3.04		2.95		1.	U
TO-14	1,1,2,2-Tetrachloroethane	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,1,2-Trichloroethane	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,1-Dichloroethane	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,1-Dichloroethene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,2,4-Trichlorobenzene	1.	UJ	1.	UJ	1.	UJ	1.	U	1.	U	1.	U
TO-14	Benzene, 1,2,4-trimethyl	0.31	J	0.35	J	0.29	J	0.29	J	0.21	J	1.	U
TO-14	Ethylene dibromide	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,2-Dichlorobenzene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,2-Dichloroethane	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,2-Dichloropropane	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,2-Dichlorotetrafluoroethane	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	cis-1,2-Dichloroethylene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Benzene, 1,3,5-trimethyl-	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,3-Dichlorobenzene	1.	U	1.	U	0.21	J	1.	U	1.	U	1.	U
TO-14	1,4-Dichlorobenzene	1.	U	1.	U	0.25	U	1.	U	1.	U	1.	U
TO-14	p-Ethyltoluene	0.25	J	0.24	J	1.	U	0.27	J	0.2	J	1.	U
TO-14	Allyl chloride	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Benzene	0.27	U	0.3	U	0.3	U	0.54	U	0.52	U	1.	U
TO-14	Benzyl chloride	1.	UJ	1.	UJ	1.	U	1.	U	1.	U	1.	U
TO-14	Carbon tetrachloride	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Chlorobenzene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Chloroethane	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Chloroform	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Dichlorodifluoromethane	4.89		5.64		0.45	J	4.75		4.		0.23	J
TO-14	Ethylbenzene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Hexachlorobutadiene	1.	UJ	1.	UJ	0.43	J	1.	UJ	1.	UJ	1.	UJ
TO-14	Bromomethane	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Chloromethane	0.38	J	0.43	J	0.23	J	0.39	J	0.34	J	1.	U
TO-14	Methylene chloride	0.31	U	0.31	U	0.29	U	0.29	U	0.55	U	0.33	U
TO-14	Styrene	3.84	R	4.16	R	1.	R	5.16	J	4.06	R	1.	R
TO-14	Tetrachloroethene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Toluene	0.45	J	0.52	J	0.27	J	0.47	J	0.53	J	1.	U
TO-14	Trichloroethene	1.	U	1.	U	1.	U	1.	UJ	1.	UJ	1.	UJ
TO-14	Trichlorofluoromethane	8.69		10.5		1.25	J	15.1		13.2		1.19	
TO-14	Trichlorotrifluoroethane (Freon 113)	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U

CHARLESTON - ZONE H
CHARLESTON ZONE H-AIR SAMPLES ONLY

	SAMPLE ID ------->	643-A-1203-F2		643-A-1304-F2		643-A-1305-F2		643-A-2103-F2		643-A-2204-F2		643-A-2302-F2	
	ORIGINAL ID ----->	643A1203F2		643A1304F2		643A1305F2		643A2103F2		643A2204F2		643A2302F2	
	LAB SAMPLE ID --->	9411290-01		9411290-03		9411290-04		9411343-03		9411343-04		9411343-02	
	ID FROM REPORT -->	643A1203F2		643A1304F2		643A1305F2		643A2103F2		643A2204F2		643A2302F2	
	SAMPLE DATE ----->	11/14/94		11/14/94		11/14/94		11/15/94		11/15/94		11/16/94	
	DATE EXTRACTED -->												
	DATE ANALYZED --->	11/17/94		11/17/94		11/17/94		11/18/94		11/18/94		11/18/94	
	MATRIX ---------->	A		A		A		A		A		A	
	UNITS ----------->	ppbv		ppbv		ppbv		ppbv		ppbv		ppbv	
Method	Parameter	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL
TO-14	Vinyl chloride	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	cis-1,3-Dichloropropene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	m+p-Xylenes	0.23	J	0.26	J	0.42	J	0.23	U	0.21	U	1.	U
TO-14	o-Xylene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	trans-1,3-Dichloropropene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U

CHARLESTON - ZONE H
CHARLESTON ZONE H-AIR SAMPLES ONLY

	SAMPLE ID ------->	643-A-2305-F2		643-A-3103-F2		643-A-3204-F2		643-A-3302-F2		643-A-3305-F2		644-A-1106-F2	
	ORIGINAL ID ----->	643A2305F2		643A3103F2		643A3204F2		643A3302F2		643A3305F2		644A1106F2	
	LAB SAMPLE ID --->	9411343-05		9411342-03		9411342-04		9411342-02		9411342-05		9411290-08	
	ID FROM REPORT -->	643A2305F2		643A3103F2		643A3204F2		643A3302F2		643A3305F2		644A1106F2	
	SAMPLE DATE ----->	11/15/94		11/16/94		11/16/94		11/16/94		11/16/94		11/14/94	
	DATE EXTRACTED -->												
	DATE ANALYZED --->	11/18/94		11/17/94		11/17/94		11/17/94		11/17/94		11/17/94	
	MATRIX ---------->	A		A		A		A		A		A	
	UNITS ----------->	ppbv		ppbv		ppbv		ppbv		ppbv		ppbv	
Method	Parameter	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL
TO-14	1,1,1-Trichloroethane	2.95		1.51	J	1.89	J	1.	UJ	1.89	J	1.	U
TO-14	1,1,2,2-Tetrachloroethane	1.	U	1.	UJ	1.	UJ	1.	UJ	1.	UJ	1.	U
TO-14	1,1,2-Trichloroethane	1.	U	1.	UJ	1.	UJ	1.	UJ	1.	UJ	1.	U
TO-14	1,1-Dichloroethane	1.	U	1.	UJ	1.	UJ	1.	UJ	1.	UJ	1.	U
TO-14	1,1-Dichloroethene	1.	U	1.	UJ	1.	UJ	1.	UJ	1.	UJ	1.	U
TO-14	1,2,4-Trichlorobenzene	1.	U	1.	UJ	1.	UJ	1.	UJ	1.	UJ	1.	UJ
TO-14	Benzene, 1,2,4-trimethyl	0.24	J	0.21	J	1.	UJ	1.	UJ	0.2	J	5.77	
TO-14	Ethylene dibromide	1.	U	1.	UJ	1.	UJ	1.	UJ	1.	UJ	1.	U
TO-14	1,2-Dichlorobenzene	1.	U	1.	UJ	1.	UJ	1.	UJ	1.	UJ	1.	U
TO-14	1,2-Dichloroethane	1.	U	1.	UJ	1.	UJ	1.	UJ	1.	UJ	1.	U
TO-14	1,2-Dichloropropane	1.	U	1.	UJ	1.	UJ	1.	UJ	1.	UJ	1.	U
TO-14	1,2-Dichlorotetrafluoroethane	1.	U	1.	UJ	1.	UJ	1.	UJ	1.	UJ	1.	U
TO-14	cis-1,2-Dichloroethylene	1.	U	1.	UJ	1.	UJ	1.	UJ	1.	UJ	1.	U
TO-14	Benzene, 1,3,5-trimethyl-	1.	U	1.	UJ	1.	UJ	1.	UJ	1.	UJ	1.82	
TO-14	1,3-Dichlorobenzene	1.	U	1.	UJ	1.	UJ	1.	UJ	1.	UJ	1.	U
TO-14	1,4-Dichlorobenzene	1.	U	1.	UJ	1.	UJ	1.	UJ	1.	UJ	0.35	U
TO-14	p-Ethyltoluene	0.22	J	1.	UJ	1.	UJ	1.	UJ	1.	UJ	5.22	
TO-14	Allyl chloride	1.	U	1.	UJ	1.	UJ	1.	UJ	1.	UJ	1.	U
TO-14	Benzene	0.61	U	0.21	UJ	0.2	UJ	1.	UJ	0.22	UJ	1.37	
TO-14	Benzyl chloride	1.	U	1.	UJ	1.	UJ	1.	UJ	1.	UJ	1.	UJ
TO-14	Carbon tetrachloride	1.	U	1.	UJ	1.	UJ	1.	UJ	1.	UJ	1.	U
TO-14	Chlorobenzene	1.	U	1.	UJ	1.	UJ	1.	UJ	1.	UJ	1.	U
TO-14	Chloroethane	1.	U	1.	UJ	1.	UJ	1.	UJ	1.	UJ	1.	U
TO-14	Chloroform	1.	U	1.	UJ	1.	UJ	1.	UJ	1.	UJ	1.	U
TO-14	Dichlorodifluoromethane	4.29		2.79	J	2.49	J	0.34	J	2.44	J	1.01	
TO-14	Ethylbenzene	1.	U	1.	UJ	1.	UJ	1.	UJ	1.	UJ	0.32	J
TO-14	Hexachlorobutadiene	1.	UJ	1.	UJ	1.	UJ	1.	UJ	1.	UJ	1.	UJ
TO-14	Bromomethane	1.	U	1.	UJ	1.	UJ	1.	UJ	1.	UJ	1.	U
TO-14	Chloromethane	0.32	J	0.55	J	0.46	J	0.3	J	0.45	J	1.01	
TO-14	Methylene chloride	0.37	U	0.28	UJ	0.34	UJ	2.13	UJ	0.32	UJ	1.	U
TO-14	Styrene	3.94	R	4.12	R	3.7	R	1.1	R	3.37	R	1.	R
TO-14	Tetrachloroethene	1.	U	1.	UJ	1.	UJ	1.	UJ	1.	UJ	1.	U
TO-14	Toluene	0.45	J	0.41	J	0.39	J	1.14	J	0.42	J	1.74	
TO-14	Trichloroethene	1.	UJ	1.	UJ	1.	UJ	1.	UJ	1.	UJ	1.	U
TO-14	Trichlorofluoromethane	14.		4.04	J	3.77	J	1.05	J	3.57	J	12.4	
TO-14	Trichlorotrifluoroethane (Freon 113)	1.	U	1.	UJ	1.	UJ	1.	UJ	1.	UJ	1.	U

CHARLESTON - ZONE H
CHARLESTON ZONE H-AIR SAMPLES ONLY

	SAMPLE ID ------->	643-A-2305-F2		643-A-3103-F2		643-A-3204-F2		643-A-3302-F2		643-A-3305-F2		644-A-1106-F2	
	ORIGINAL ID ----->	643A2305F2		643A3103F2		643A3204F2		643A3302F2		643A3305F2		644A1106F2	
	LAB SAMPLE ID --->	9411343-05		9411342-03		9411342-04		9411342-02		9411342-05		9411290-08	
	ID FROM REPORT -->	643A2305F2		643A3103F2		643A3204F2		643A3302F2		643A3305F2		644A1106F2	
	SAMPLE DATE ----->	11/15/94		11/16/94		11/16/94		11/16/94		11/16/94		11/14/94	
	DATE EXTRACTED -->												
	DATE ANALYZED --->	11/18/94		11/17/94		11/17/94		11/17/94		11/17/94		11/17/94	
	MATRIX ---------->	A		A		A		A		A		A	
	UNITS ----------->	ppbv		ppbv		ppbv		ppbv		ppbv		ppbv	
Method	Parameter	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL
TO-14	Vinyl chloride	1.	U	1.	UJ	1.	UJ	1.	UJ	1.	UJ	1.	U
TO-14	cis-1,3-Dichloropropene	1.	U	1.	UJ	1.	UJ	1.	UJ	1.	UJ	1.	U
TO-14	m+p-Xylenes	1.	U	1.	UJ	1.	UJ	1.	UJ	1.	UJ	1.36	
TO-14	o-Xylene	1.	U	1.	UJ	1.	UJ	1.	UJ	1.	UJ	0.93	J
TO-14	trans-1,3-Dichloropropene	1.	U	1.	UJ	1.	UJ	1.	UJ	1.	UJ	1.	U

	SAMPLE ID ------->	644-A-1207-F2		644-A-1308-F2		644-A-1309-F2		644-A-2107-F2		644-A-2206-F2		644-A-2308-F2	
	ORIGINAL ID ----->	644A1207F2		644A1308F2		644A1309F2		644A2107F2		644A2206F2		644A2308F2	
	LAB SAMPLE ID --->	9411290-05		9411290-06		9411290-07		9411343-07		9411343-06		9411343-08	
	ID FROM REPORT -->	644A1207F2		644A1308F2		644A1309F2		644A2107F2		644A2206F2		644A2308F2	
	SAMPLE DATE ----->	11/14/94		11/14/94		11/14/94		11/15/94		11/15/94		11/15/94	
	DATE EXTRACTED -->												
	DATE ANALYZED --->	11/17/94		11/17/94		11/17/94		11/20/94		11/20/94		11/20/94	
	MATRIX ---------->	A		A		A		A		A		A	
	UNITS ----------->	ppbv		ppbv		ppbv		ppbv		ppbv		ppbv	
Method	Parameter	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL
TO-14	1,1,1-Trichloroethane	1.	U	1.	UJ	1.	UJ	1.	U	1.	U	1.	U
TO-14	1,1,2,2-Tetrachloroethane	1.	U	1.	UJ	1.	UJ	1.	U	1.	U	1.	U
TO-14	1,1,2-Trichloroethane	1.	U	1.	UJ	1.	UJ	1.	U	1.	U	1.	U
TO-14	1,1-Dichloroethane	1.	U	1.	UJ	1.	UJ	1.	U	1.	U	1.	U
TO-14	1,1-Dichloroethene	1.	U	1.	UJ	1.	UJ	1.	U	1.	U	1.	U
TO-14	1,2,4-Trichlorobenzene	1.	UJ	1.	UJ	1.	UJ	1.	U	0.34	J	1.	U
TO-14	Benzene, 1,2,4-trimethyl	0.53	J	0.41	J	1.	UJ	7.04		0.44	J	0.22	J
TO-14	Ethylene dibromide	1.	U	1.	UJ	1.	UJ	1.	U	1.	U	1.	U
TO-14	1,2-Dichlorobenzene	1.	U	1.	UJ	1.	UJ	1.	U	1.	U	1.	U
TO-14	1,2-Dichloroethane	1.	U	1.	UJ	1.	UJ	1.	U	1.	U	1.	U
TO-14	1,2-Dichloropropane	1.	U	1.	UJ	1.	UJ	1.	U	1.	U	1.	U
TO-14	1,2-Dichlorotetrafluoroethane	1.	U	1.	UJ	1.	UJ	1.	U	1.	U	1.	U
TO-14	cis-1,2-Dichloroethylene	1.	U	1.	UJ	1.	UJ	1.	U	1.	U	1.	U
TO-14	Benzene, 1,3,5-trimethyl-	1.	U	1.	UJ	1.	UJ	2.08		1.	U	1.	U
TO-14	1,3-Dichlorobenzene	1.	U	1.	UJ	1.	UJ	1.	U	1.	U	1.	U
TO-14	1,4-Dichlorobenzene	1.	U	1.	UJ	1.	UJ	1.	U	1.	U	1.	U
TO-14	p-Ethyltoluene	0.37	J	0.29	J	1.	UJ	5.99		0.36	J	1.	U
TO-14	Allyl chloride	1.	U	1.	UJ	1.	UJ	1.	U	1.	U	1.	U
TO-14	Benzene	0.22	U	0.21	UJ	0.41	UJ	0.84	U	1.	U	1.	U
TO-14	Benzyl chloride	1.	UJ	1.	UJ	1.	UJ	1.	U	0.43	J	1.	U
TO-14	Carbon tetrachloride	1.	U	1.	UJ	1.	UJ	1.	U	1.	U	1.	U
TO-14	Chlorobenzene	1.	U	1.	UJ	1.	UJ	1.	U	1.	U	1.	U
TO-14	Chloroethane	1.	U	1.	UJ	1.	UJ	1.	U	1.	U	1.	U
TO-14	Chloroform	1.	U	1.	UJ	1.	UJ	1.	U	1.	U	1.	U
TO-14	Dichlorodifluoromethane	0.43	J	0.52	J	0.41	J	1.		0.36	J	0.4	J
TO-14	Ethylbenzene	1.	U	1.	UJ	1.	UJ	0.24	J	1.	U	1.	U
TO-14	Hexachlorobutadiene	1.	UJ	1.	UJ	1.	UJ	1.	UJ	0.4	J	1.	UJ
TO-14	Bromomethane	1.	U	1.	UJ	1.	UJ	1.	U	1.	U	1.	U
TO-14	Chloromethane	1.	U	0.23	J	0.52	J	0.7	J	1.	U	1.	U
TO-14	Methylene chloride	1.	U	0.29	UJ	0.34	UJ	0.38	U	0.21	U	0.45	U
TO-14	Styrene	1.	R	1.	R	1.	R	3.11	R	0.88	R	1.	R
TO-14	Tetrachloroethene	1.	U	1.	UJ	1.	UJ	1.	U	1.	U	1.	U
TO-14	Toluene	0.25	J	0.2	J	0.34	J	0.81	J	1.	U	1.	U
TO-14	Trichloroethene	1.	U	1.	UJ	1.	UJ	1.	UJ	1.	UJ	1.	UJ
TO-14	Trichlorofluoromethane	1.7		2.35	J	0.32	J	20.4	J	1.84	J	1.7	J
TO-14	Trichlorotrifluoroethane (Freon 113)	1.	U	1.	UJ	1.	UJ	1.	U	1.	U	1.	U

	SAMPLE ID ------->	644-A-1207-F2		644-A-1308-F2		644-A-1309-F2		644-A-2107-F2		644-A-2206-F2		644-A-2308-F2	
	ORIGINAL ID ----->	644A1207F2		644A1308F2		644A1309F2		644A2107F2		644A2206F2		644A2308F2	
	LAB SAMPLE ID --->	9411290-05		9411290-06		9411290-07		9411343-07		9411343-06		9411343-08	
	ID FROM REPORT -->	644A1207F2		644A1308F2		644A1309F2		644A2107F2		644A2206F2		644A2308F2	
	SAMPLE DATE ----->	11/14/94		11/14/94		11/14/94		11/15/94		11/15/94		11/15/94	
	DATE EXTRACTED -->												
	DATE ANALYZED --->	11/17/94		11/17/94		11/17/94		11/20/94		11/20/94		11/20/94	
	MATRIX ---------->	A		A		A		A		A		A	
	UNITS ----------->	ppbv		ppbv		ppbv		ppbv		ppbv		ppbv	
Method	Parameter	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL
TO-14	Vinyl chloride	1.	U	1.	UJ	1.	UJ	1.	U	1.	U	1.	U
TO-14	cis-1,3-Dichloropropene	1.	U	1.	UJ	1.	UJ	1.	U	1.	U	1.	U
TO-14	m+p-Xylenes	1.	U	1.	UJ	1.	UJ	1.09		1.	U	1.	U
TO-14	o-Xylene	1.	U	1.	UJ	1.	UJ	0.79	J	1.	U	1.	U
TO-14	trans-1,3-Dichloropropene	1.	U	1.	UJ	1.	UJ	1.	U	1.	U	1.	U

CHARLESTON - ZONE H
CHARLESTON ZONE H-AIR SAMPLES ONLY

	SAMPLE ID ------->	644-A-2309-F2		644-A-3106-F2		644-A-3207-F2		644-A-3308-F2		644-A-3309-F2		644-A-3410-F2	
	ORIGINAL ID ----->	644A2309F2		644A3106F2		644A3207F2		644A3308F2		644A3309F2		644A3410F2	
	LAB SAMPLE ID --->	9411343-09		9411342-06		9411342-07		9411342-08		9411342-09		9411342-10	
	ID FROM REPORT -->	644A2309F2		644A3106F2		644A3207F2		644A3308F2		644A3309F2		644A3410F2	
	SAMPLE DATE ----->	11/15/94		11/16/94		11/16/94		11/16/94		11/16/94		11/16/94	
	DATE EXTRACTED -->												
	DATE ANALYZED --->	11/18/94		11/17/94		11/18/94		11/18/94		11/18/94		11/18/94	
	MATRIX ---------->	A		A		A		A		A		A	
	UNITS ----------->	ppbv		ppbv		ppbv		ppbv		ppbv		ppbv	
Method	Parameter	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL
TO-14	1,1,1-Trichloroethane	1.	UJ	0.34	J	1.	U	1.	U	1.	U	1.	U
TO-14	1,1,2,2-Tetrachloroethane	1.	UJ	1.	UJ	1.	U	1.	U	1.	U	1.	U
TO-14	1,1,2-Trichloroethane	1.	UJ	1.	UJ	1.	U	1.	U	1.	U	1.	U
TO-14	1,1-Dichloroethane	1.	UJ	1.	UJ	1.	U	1.	U	1.	U	1.	U
TO-14	1,1-Dichloroethene	1.	UJ	1.	UJ	1.	U	1.	U	1.	U	1.	U
TO-14	1,2,4-Trichlorobenzene	1.	UJ	1.	UJ	1.	UJ	1.	U	1.	U	1.	U
TO-14	Benzene, 1,2,4-trimethyl	1.	UJ	9.97	J	0.58	J	0.32	J	1.	U	1.	U
TO-14	Ethylene dibromide	1.	UJ	1.	UJ	1.	U	1.	U	1.	U	1.	U
TO-14	1,2-Dichlorobenzene	1.	UJ	1.	UJ	1.	U	1.	U	1.	U	1.	U
TO-14	1,2-Dichloroethane	1.	UJ	1.	UJ	1.	U	1.	U	1.	U	1.	U
TO-14	1,2-Dichloropropane	1.	UJ	1.	UJ	1.	U	1.	U	1.	U	1.	U
TO-14	1,2-Dichlorotetrafluoroethane	1.	UJ	1.	UJ	1.	U	1.	U	1.	U	1.	U
TO-14	cis-1,2-Dichloroethylene	1.	UJ	1.	UJ	1.	U	1.	U	1.	U	1.	U
TO-14	Benzene, 1,3,5-trimethyl-	1.	UJ	2.96	J	1.	U	1.	U	1.	U	1.	U
TO-14	1,3-Dichlorobenzene	1.	UJ	1.	UJ	1.	U	1.	U	1.	U	1.	U
TO-14	1,4-Dichlorobenzene	1.	UJ	1.	UJ	1.	U	1.	U	1.	U	1.	U
TO-14	p-Ethyltoluene	1.	UJ	8.59	J	0.47	J	0.25	J	1.	U	0.21	J
TO-14	Allyl chloride	1.	UJ	1.	UJ	1.	U	1.	U	1.	U	1.	U
TO-14	Benzene	1.	UJ	0.43	UJ	1.	U	1.	U	0.72	U	0.72	U
TO-14	Benzyl chloride	1.	UJ	1.	UJ	1.	U	1.	U	1.	U	1.	U
TO-14	Carbon tetrachloride	1.	UJ	1.	UJ	1.	U	1.	U	1.	U	1.	U
TO-14	Chlorobenzene	1.	UJ	1.	UJ	1.	U	1.	U	1.	U	1.	U
TO-14	Chloroethane	1.	UJ	1.	UJ	1.	U	1.	U	1.	U	1.	U
TO-14	Chloroform	1.	UJ	1.	UJ	1.	U	1.	U	1.	U	1.	U
TO-14	Dichlorodifluoromethane	0.33	J	0.72	J	0.32	J	0.3	J	0.21	J	0.26	J
TO-14	Ethylbenzene	1.	UJ	0.23	J	1.	U	1.	U	1.	U	1.	U
TO-14	Hexachlorobutadiene	1.	UJ	1.	UJ	1.	UJ	1.	UJ	1.	UJ	1.	UJ
TO-14	Bromomethane	1.	UJ	1.	UJ	1.	U	1.	U	1.	U	1.	U
TO-14	Chloromethane	0.41	J	0.73	J	1.	U	1.	U	0.32	J	0.34	J
TO-14	Methylene chloride	0.28	UJ	0.35	UJ	0.29	U	0.32	U	0.31	U	0.29	U
TO-14	Styrene	1.	R	1.	R	1.	R	1.	R	1.26	R	1.86	R
TO-14	Tetrachloroethene	1.	UJ	1.	UJ	1.	U	1.	U	1.	U	1.	U
TO-14	Toluene	0.24	J	0.9	J	1.	U	1.	U	0.22	J	0.36	J
TO-14	Trichloroethene	1.	UJ	1.	UJ	1.	U	1.	UJ	1.	UJ	1.	UJ
TO-14	Trichlorofluoromethane	0.31	J	18.3	J	1.59	J	1.47		0.28	J	1.8	
TO-14	Trichlorotrifluoroethane (Freon 113)	1.	UJ	1.	UJ	1.	U	1.	U	1.	U	1.	U

	SAMPLE ID ------->	644-A-2309-F2		644-A-3106-F2		644-A-3207-F2		644-A-3308-F2		644-A-3309-F2		644-A-3410-F2	
	ORIGINAL ID ----->	644A2309F2		644A3106F2		644A3207F2		644A3308F2		644A3309F2		644A3410F2	
	LAB SAMPLE ID --->	9411343-09		9411342-06		9411342-07		9411342-08		9411342-09		9411342-10	
	ID FROM REPORT -->	644A2309F2		644A3106F2		644A3207F2		644A3308F2		644A3309F2		644A3410F2	
	SAMPLE DATE ----->	11/15/94		11/16/94		11/16/94		11/16/94		11/16/94		11/16/94	
	DATE EXTRACTED -->												
	DATE ANALYZED --->	11/18/94		11/17/94		11/18/94		11/18/94		11/18/94		11/18/94	
	MATRIX ---------->	A		A		A		A		A		A	
	UNITS ----------->	ppbv		ppbv		ppbv		ppbv		ppbv		ppbv	
Method	Parameter	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL
TO-14	Vinyl chloride	1.	UJ	1.	UJ	1.	U	1.	U	1.	U	1.	U
TO-14	cis-1,3-Dichloropropene	1.	UJ	1.	UJ	1.	U	1.	U	1.	U	1.	U
TO-14	m+p-Xylenes	1.	UJ	1.07	J	1.	U	1.	U	1.	U	0.28	U
TO-14	o-Xylene	1.	UJ	0.95	J	1.	U	1.	U	1.	U	1.	U
TO-14	trans-1,3-Dichloropropene	1.	UJ	1.	UJ	1.	U	1.	U	1.	U	1.	U

	SAMPLE ID -------->	645-A-1104-F2		645-A-1205-F2		645-A-1306-F2		645-A-1307-F2		645-A-2107-F2		645-A-2205-F2	
	ORIGINAL ID ----->	645A1104F2		645A1205F2		645A1306F2		645A1307F2		645A2107F2		645A2205F2	
	LAB SAMPLE ID --->	9411166-04		9411166-05		9411166-06		9411166-07		9411217-16		9411217-14	
	ID FROM REPORT -->	645A1104F2		645A1205F2		645A1306F2		645A1307F2		645A2107F2		645A2205F2	
	SAMPLE DATE ----->	11/08/94		11/08/94		11/08/94		11/08/94		11/10/94		11/10/94	
	DATE EXTRACTED -->												
	DATE ANALYZED --->	11/09/94		11/09/94		11/10/94		11/10/94		11/16/94		11/15/94	
	MATRIX ----------->	A		A		A		A		A		A	
	UNITS ------------>	ppbv		ppbv		ppbv		ppbv		ppbv		ppbv	
Method	Parameter	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL
TO-14	1,1,1-Trichloroethane	1.	U	1.	U	20.	U	0.27	U	10.	U	0.28	U
TO-14	1,1,2,2-Tetrachloroethane	1.	U	1.	U	20.	U	1.	U	10.	U	1.	U
TO-14	1,1,2-Trichloroethane	1.	U	1.	U	20.	U	1.	U	10.	U	1.	U
TO-14	1,1-Dichloroethane	1.	U	1.	U	20.	U	1.	U	10.	U	1.	U
TO-14	1,1-Dichloroethene	1.	U	1.	U	20.	U	1.	U	10.	U	1.	U
TO-14	1,2,4-Trichlorobenzene	1.	U	1.	U	20.	U	1.	U	10.	UJ	1.	U
TO-14	Benzene, 1,2,4-trimethyl	0.33	U	1.	U	4310.	J	0.29	U	10.	U	0.31	U
TO-14	Ethylene dibromide	1.	U	1.	U	20.	U	1.	U	10.	U	1.	U
TO-14	1,2-Dichlorobenzene	1.	U	1.	U	20.	U	1.	U	10.	U	1.	U
TO-14	1,2-Dichloroethane	1.	U	1.	U	20.	U	1.	U	10.	U	1.	U
TO-14	1,2-Dichloropropane	1.	U	1.	U	20.	U	1.	U	10.	U	1.	U
TO-14	1,2-Dichlorotetrafluoroethane	1.	U	1.	U	20.	U	1.	U	10.	U	1.	U
TO-14	cis-1,2-Dichloroethylene	1.	U	1.	U	20.	U	1.	U	10.	U	1.	U
TO-14	Benzene, 1,3,5-trimethyl-	1.	U	1.	U	772.	J	1.	U	10.	U	1.	U
TO-14	1,3-Dichlorobenzene	1.	U	1.	U	20.	U	1.	U	10.	U	1.	U
TO-14	1,4-Dichlorobenzene	1.36	U	0.54	U	20.	U	1.	U	4.4	U	2.7	U
TO-14	p-Ethyltoluene	1.	U	1.	U	2520.	J	1.	U	10.	U	1.	U
TO-14	Allyl chloride	1.	U	1.	U	20.	U	1.	U	10.	U	1.	U
TO-14	Benzene	0.3	U	1.	U	20.	U	1.	U	10.	U	0.29	U
TO-14	Benzyl chloride	1.	U	1.	U	20.	U	1.	UJ	10.	UJ	1.	U
TO-14	Carbon tetrachloride	1.	U	1.	U	20.	U	1.	U	10.	U	1.	U
TO-14	Chlorobenzene	1.	U	1.	U	20.	U	1.	U	10.	U	1.	U
TO-14	Chloroethane	1.	U	1.	U	20.	U	1.	U	10.	U	1.	UJ
TO-14	Chloroform	1.	U	1.	U	20.	U	1.	U	10.	U	1.	U
TO-14	Dichlorodifluoromethane	0.38	U	0.43	U	20.	U	0.51	U	10.	U	0.49	U
TO-14	Ethylbenzene	1.	U	1.	U	119.	J	1.	U	10.	U	1.	U
TO-14	Hexachlorobutadiene	1.	U	1.	U	20.	U	1.	U	10.	UJ	1.	U
TO-14	Bromomethane	1.	U	1.	U	20.	U	1.	U	10.	U	1.	U
TO-14	Chloromethane	0.27	U	1.	U	20.	U	1.	U	10.	U	0.21	U
TO-14	Methylene chloride	0.87	U	0.48	U	4.4	U	0.9	U	2.2	U	0.21	U
TO-14	Styrene	1.	R	1.	R	404.	J	1.	R	10.	R	1.	R
TO-14	Tetrachloroethene	1.	U	1.	U	20.	U	1.	U	10.	U	1.	U
TO-14	Toluene	0.71	U	0.3	U	6.	U	0.24	U	10.	U	0.65	U
TO-14	Trichloroethene	1.	U	1.	U	20.	U	1.	U	10.	U	1.	U
TO-14	Trichlorofluoromethane	2.78	U	2.18	U	20.	U	1.97	U	10.	U	0.44	U
TO-14	Trichlorotrifluoroethane (Freon 113)	1.	U	1.	U	20.	U	1.	U	10.	U	1.	U

*** Validation Complete ***

	SAMPLE ID ------->	645-A-1104-F2		645-A-1205-F2		645-A-1306-F2		645-A-1307-F2		645-A-2107-F2		645-A-2205-F2	
	ORIGINAL ID ----->	645A1104F2		645A1205F2		645A1306F2		645A1307F2		645A2107F2		645A2205F2	
	LAB SAMPLE ID --->	9411166-04		9411166-05		9411166-06		9411166-07		9411217-16		9411217-14	
	ID FROM REPORT -->	645A1104F2		645A1205F2		645A1306F2		645A1307F2		645A2107F2		645A2205F2	
	SAMPLE DATE ----->	11/08/94		11/08/94		11/08/94		11/08/94		11/10/94		11/10/94	
	DATE EXTRACTED -->												
	DATE ANALYZED --->	11/09/94		11/09/94		11/10/94		11/10/94		11/16/94		11/15/94	
	MATRIX ---------->	A		A		A		A		A		A	
	UNITS ----------->	ppbv		ppbv		ppbv		ppbv		ppbv		ppbv	
Method	Parameter	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL
TO-14	Vinyl chloride	1.	U	1.	U	20.	U	1.	U	10.	U	1.	U
TO-14	cis-1,3-Dichloropropene	1.	U	1.	U	20.	U	1.	U	10.	U	1.	U
TO-14	m+p-Xylenes	0.38	U	1.	U	722.	J	0.23	U	10.	U	0.47	U
TO-14	o-Xylene	1.	U	1.	U	569.	J	1.	U	10.	U	1.	U
TO-14	trans-1,3-Dichloropropene	1.	U	1.	U	20.	U	1.	U	10.	U	1.	U

CHARLESTON - ZONE H
CHARLESTON ZONE H-AIR SAMPLES ONLY

	SAMPLE ID ------->	645-A-2304-F2		645-A-2306-F2		645-A-3105-F2		645-A-3206-F2		645-A-3307-F2		645-A-3308-F2	
	ORIGINAL ID ----->	645A2304F2		645A2306F2		645A3105F2		645A3206F2		645A3307F2		645A3308F2	
	LAB SAMPLE ID --->	9411217-13		9411217-15		9411217-05		9411217-06		9411217-07		9411217-08	
	ID FROM REPORT -->	645A2304F2		645A2306F2		645A3105F2		645A3206F2		645A3307F2		645A3308F2	
	SAMPLE DATE ----->	11/10/94		11/10/94		11/10/94		11/10/94		11/10/94		11/10/94	
	DATE EXTRACTED -->												
	DATE ANALYZED --->	11/15/94		11/15/94		11/12/94		11/12/94		11/12/94		11/14/94	
	MATRIX ---------->	A		A		A		A		A		A	
	UNITS ----------->	ppbv		ppbv		ppbv		ppbv		ppbv		ppbv	
Method	Parameter	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL
TO-14	1,1,1-Trichloroethane	0.26	U	100.	U	1.	U	1.	U	0.22	U	20.	U
TO-14	1,1,2,2-Tetrachloroethane	1.	U	100.	U	1.	U	1.	U	1.	U	20.	U
TO-14	1,1,2-Trichloroethane	1.	U	100.	U	1.	U	1.	U	1.	U	20.	U
TO-14	1,1-Dichloroethane	1.	U	100.	U	1.	U	1.	U	1.	U	20.	U
TO-14	1,1-Dichloroethene	1.	U	100.	U	1.	U	1.	U	1.	U	20.	U
TO-14	1,2,4-Trichlorobenzene	1.	U	100.	U	1.	U	1.	U	1.	U	20.	U
TO-14	Benzene, 1,2,4-trimethyl	1.	U	100.	U	0.58	U	0.53	U	1.03	U	20.	U
TO-14	Ethylene dibromide	1.	U	100.	U	1.	U	1.	U	1.	U	20.	U
TO-14	1,2-Dichlorobenzene	1.	U	100.	U	1.	U	1.	U	1.	U	20.	U
TO-14	1,2-Dichloroethane	1.	U	100.	U	1.	U	1.	U	1.	U	20.	U
TO-14	1,2-Dichloropropane	1.	U	100.	U	1.	U	1.	U	1.	U	20.	U
TO-14	1,2-Dichlorotetrafluoroethane	1.	U	100.	U	1.	U	1.	U	1.	U	20.	U
TO-14	cis-1,2-Dichloroethylene	1.	U	100.	U	1.	U	1.	U	1.	U	20.	U
TO-14	Benzene, 1,3,5-trimethyl-	1.	U	100.	U	1.	U	1.	U	0.26	U	20.	U
TO-14	1,3-Dichlorobenzene	1.	U	100.	U	1.	U	1.	U	1.	U	20.	U
TO-14	1,4-Dichlorobenzene	0.4	U	100.	U	1.24	U	1.11	U	2.53	U	20.	U
TO-14	p-Ethyltoluene	1.	U	100.	UJ	0.33	U	0.32	U	0.49	UJ	20.	U
TO-14	Allyl chloride	1.	U	100.	U	1.	U	1.	U	1.	U	20.	U
TO-14	Benzene	1.	U	100.	U	0.32	U	0.26	U	0.28	U	20.	U
TO-14	Benzyl chloride	1.	U	100.	U	1.	U	1.	U	1.	U	20.	U
TO-14	Carbon tetrachloride	1.	U	100.	U	1.	U	1.	U	1.	U	20.	U
TO-14	Chlorobenzene	1.	U	100.	U	1.	U	1.	U	1.	U	20.	U
TO-14	Chloroethane	1.	UJ	100.	U	1.	U	1.	U	0.62	J	20.	UJ
TO-14	Chloroform	0.2	J	100.	U	1.	U	1.	U	1.	U	20.	U
TO-14	Dichlorodifluoromethane	0.57	U	100.	U	0.54	U	0.71	U	0.49	U	20.	U
TO-14	Ethylbenzene	1.	U	100.	U	1.	U	1.	U	1.	U	20.	U
TO-14	Hexachlorobutadiene	1.	U	100.	U	1.	U	1.	U	1.	U	20.	U
TO-14	Bromomethane	1.	U	100.	U	1.	U	1.	U	1.	U	20.	U
TO-14	Chloromethane	1.	U	100.	U	0.69	U	0.74	U	0.82	U	20.	U
TO-14	Methylene chloride	1.	U	100.	U	0.47	U	0.47	U	0.43	U	20.	U
TO-14	Styrene	1.	R	100.	R	1.	R	1.	R	1.	R	20.	R
TO-14	Tetrachloroethene	1.	U	100.	U	1.	U	1.	U	1.	U	20.	U
TO-14	Toluene	0.33	U	100.	U	0.74	U	0.62	U	0.68	U	20.	U
TO-14	Trichloroethene	1.	U	100.	U	1.	U	1.	U	1.	U	20.	U
TO-14	Trichlorofluoromethane	0.47	U	100.	U	0.27	U	0.36	U	0.27	U	20.	U
TO-14	Trichlorotrifluoroethane (Freon 113)	1.	U	100.	U	1.	U	1.	U	1.	U	20.	U

CHARLESTON - ZONE H
CHARLESTON ZONE H-AIR SAMPLES ONLY

	SAMPLE ID ------->	645-A-2304-F2		645-A-2306-F2		645-A-3105-F2		645-A-3206-F2		645-A-3307-F2		645-A-3308-F2	
	ORIGINAL ID ----->	645A2304F2		645A2306F2		645A3105F2		645A3206F2		645A3307F2		645A3308F2	
	LAB SAMPLE ID --->	9411217-13		9411217-15		9411217-05		9411217-06		9411217-07		9411217-08	
	ID FROM REPORT -->	645A2304F2		645A2306F2		645A3105F2		645A3206F2		645A3307F2		645A3308F2	
	SAMPLE DATE ----->	11/10/94		11/10/94		11/10/94		11/10/94		11/10/94		11/10/94	
	DATE EXTRACTED -->												
	DATE ANALYZED --->	11/15/94		11/15/94		11/12/94		11/12/94		11/12/94		11/14/94	
	MATRIX ---------->	A		A		A		A		A		A	
	UNITS ----------->	ppbv		ppbv		ppbv		ppbv		ppbv.		ppbv	
Method	Parameter	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL
TO-14	Vinyl chloride	1.	U	100.	U	1.	U	1.	U	1.	U	20.	U
TO-14	cis-1,3-Dichloropropene	1.	U	100.	U	1.	U	1.	U	1.	U	20.	U
TO-14	m+p-Xylenes	0.2	U	100.	U	0.59	U	0.56	U	0.63	U	20.	U
TO-14	o-Xylene	0.36	U	100.	U	0.26	U	0.24	U	0.27	U	20.	U
TO-14	trans-1,3-Dichloropropene	1.	U	100.	U	1.	U	1.	U	1.	U	20.	U

CHARLESTON - ZONE H
CHARLESTON ZONE H-AIR SAMPLES ONLY

	SAMPLE ID ------->	645-A-4008-F2		656-A-1103-F2		656-A-1106-F2		656-A-1202-F2		656-A-1207-F2		656-A-1305-F2	
	ORIGINAL ID ----->	645A4008F2		656A1103F2		656A1106F2		656A1202F2		656A1207F2		656A1305F2	
	LAB SAMPLE ID --->	9411217-17		9412184-03		9412184-05		9412184-02		9412184-06		9412184-04	
	ID FROM REPORT -->	645A4008F2		656A1103F2		656A1106F2		656A1202F2		656A1207F2		656A1305F2	
	SAMPLE DATE ----->	11/10/94		12/06/94		12/06/94		12/06/94		12/06/94		12/06/94	
	DATE EXTRACTED -->												
	DATE ANALYZED --->	11/15/94		12/12/94		12/13/94		12/13/94		12/13/94		12/13/94	
	MATRIX ---------->	A		A		A		A		A		A	
	UNITS ----------->	ppbv		ppbv		ppbv		ppbv		ppbv		ppbv	
Method	Parameter	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL
TO-14	1,1,1-Trichloroethane	0.3	U	0.52	J	0.28	J	0.5	J	0.22	J	1.	U
TO-14	1,1,2,2-Tetrachloroethane	1.	U	1.	U	1.	UJ	1.	U	1.	U	1.	U
TO-14	1,1,2-Trichloroethane	1.	U	1.	U	1.	UJ	1.	U	1.	U	1.	U
TO-14	1,1-Dichloroethane	1.	U	1.	U	1.	UJ	1.	U	1.	U	1.	U
TO-14	1,1-Dichloroethene	1.	U	1.	U	1.	UJ	1.	U	1.	U	1.	U
TO-14	1,2,4-Trichlorobenzene	1.	U	1.	U	1.	UJ	1.	U	1.	U	1.	U
TO-14	Benzene, 1,2,4-trimethyl	0.54	U	0.66	J	0.33	J	0.55	J	1.	U	1.	U
TO-14	Ethylene dibromide	1.	U	1.	U	1.	UJ	1.	U	1.	U	1.	U
TO-14	1,2-Dichlorobenzene	1.	U	1.	U	1.	UJ	1.	U	1.	U	1.	U
TO-14	1,2-Dichloroethane	1.	U	1.	U	1.	UJ	1.	U	1.	U	1.	U
TO-14	1,2-Dichloropropane	1.	U	1.	U	1.	UJ	1.	U	1.	U	1.	U
TO-14	1,2-Dichlorotetrafluoroethane	1.	U	1.	U	1.	UJ	1.	U	1.	U	1.	U
TO-14	cis-1,2-Dichloroethylene	1.	U	1.	U	1.	UJ	1.	U	1.	U	1.	U
TO-14	Benzene, 1,3,5-trimethyl-	1.	U	0.26	J	1.	UJ	0.23	J	1.	U	1.	U
TO-14	1,3-Dichlorobenzene	1.	U	1.	U	1.	UJ	1.	U	1.	U	1.	U
TO-14	1,4-Dichlorobenzene	4.88	U	0.52	J	1.	UJ	0.46	J	1.	U	1.	U
TO-14	p-Ethyltoluene	0.38	U	0.44	J	0.33	J	0.55	J	1.	U	1.	U
TO-14	Allyl chloride	1.	U	1.	U	1.	UJ	1.	U	1.	U	1.	U
TO-14	Benzene	0.45	U	0.36	J	0.25	J	0.33	J	1.	U	1.	U
TO-14	Benzyl chloride	1.	U	1.	U	1.	UJ	1.	U	1.	U	1.	U
TO-14	Carbon tetrachloride	1.	U	1.	U	1.	UJ	1.	U	1.	U	1.	U
TO-14	Chlorobenzene	1.	U	1.	U	1.	UJ	1.	U	1.	U	1.	U
TO-14	Chloroethane	1.	UJ	1.	U	1.	UJ	1.	U	1.	U	1.	U
TO-14	Chloroform	1.	U	1.	U	1.	UJ	1.	U	1.	U	1.	U
TO-14	Dichlorodifluoromethane	0.5	U	1.87		0.75	J	1.89		0.66	J	0.37	J
TO-14	Ethylbenzene	0.34	U	0.24	J	1.	UJ	0.22	J	1.	U	1.	U
TO-14	Hexachlorobutadiene	1.	U	1.	U	1.	UJ	1.	U	1.	U	1.	U
TO-14	Bromomethane	1.	U	1.	U	1.	UJ	1.	U	1.	U	1.	U
TO-14	Chloromethane	0.35	U	0.52	J	0.34	J	0.5	J	0.21	J	0.32	J
TO-14	Methylene chloride	1.	U	0.7	J	0.38	J	0.65	J	0.31	J	0.51	J
TO-14	Styrene	22.3	J	3.97	J	1.92	J	3.47	J	0.94	J	1.	R
0-14	Tetrachloroethene	0.2	J	0.83	J	0.25	J	0.82	J	0.2	J	1.	U
0-14	Toluene	1.	U	4.92		5.94	J	4.87		5.21		0.35	J
0-14	Trichloroethene	1.	U	1.	U	1.	UJ	1.	U	1.	U	1.	U
0-14	Trichlorofluoromethane	0.76	U	0.8	J	0.48	J	0.93	J	0.47	J	0.42	J
0-14	Trichlorotrifluoroethane (Freon 113)	1.	U	1.	U	1.	UJ	1.	U	1.	U	1.	U

CHARLESTON - ZONE H
CHARLESTON ZONE H-AIR SAMPLES ONLY

	SAMPLE ID -------->	645-A-4008-F2		656-A-1103-F2		656-A-1106-F2		656-A-1202-F2		656-A-1207-F2		656-A-1305-F2	
	ORIGINAL ID ----->	645A4008F2		656A1103F2		656A1106F2		656A1202F2		656A1207F2		656A1305F2	
	LAB SAMPLE ID --->	9411217-17		9412184-03		9412184-05		9412184-02		9412184-06		9412184-04	
	ID FROM REPORT -->	645A4008F2		656A1103F2		656A1106F2		656A1202F2		656A1207F2		656A1305F2	
	SAMPLE DATE ----->	11/10/94		12/06/94		12/06/94		12/06/94		12/06/94		12/06/94	
	DATE EXTRACTED -->												
	DATE ANALYZED --->	11/15/94		12/12/94		12/13/94		12/13/94		12/13/94		12/13/94	
	MATRIX ---------->	A		A		A		A		A		A	
	UNITS ----------->	ppbv		ppbv		ppbv		ppbv		ppbv		ppbv	
Method	**Parameter**	**AIR**	**VAL**	**AIR**	**VAL**	**AIR**	**VAL**	**AIR**	**VAL**	**AIR**	**VAL**	**AIR**	**VAL**
TO-14	Vinyl chloride	1.	U	1.	U	1.	UJ	1.	U	1.	U	1.	U
TO-14	cis-1,3-Dichloropropene	1.	U	1.	U	1.	UJ	1.	U	1.	U	1.	U
TO-14	m+p-Xylenes	0.98	U	0.92	J	0.46	J	0.87	J	1.	U	1.	U
TO-14	o-Xylene	0.52	U	1.	U	1.	UJ	1.	U	1.	U	1.	U
TO-14	trans-1,3-Dichloropropene	1.	U	1.	U	1.	UJ	1.	U	1.	U	1.	U

	SAMPLE ID ------->	656-A-1308-F2		656-A-2106-F2		656-A-2109-F2		656-A-2110-F2		656-A-2207-F2		656-A-2208-F2	
	ORIGINAL ID ----->	656A1308F2		656A2106F2		656A2109F2		656A2110F2		656A2207F2		656A2208F2	
	LAB SAMPLE ID --->	9412184-07		9412185-06		9412185-09		9412185-10		9412185-07		9412185-08	
	ID FROM REPORT -->	656A1308F2		656A2106F2		656A2109F2		656A2110F2		656A2207F2		656A2208F2	
	SAMPLE DATE ----->	12/06/94		12/07/94		12/07/94		12/07/94		12/07/94		12/07/94	
	DATE EXTRACTED -->												
	DATE ANALYZED --->	12/12/94		12/13/94		12/14/94		12/12/94		12/13/94		12/12/94	
	MATRIX ---------->	A		A		A		A		A		A	
	UNITS ----------->	ppbv		ppbv		ppbv		ppbv		ppbv		ppbv	
Method	Parameter	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL
TO-14	1,1,1-Trichloroethane	1.	UJ	1.	U	0.42	J	0.33	J	1.	U	0.42	J
TO-14	1,1,2,2-Tetrachloroethane	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,1,2-Trichloroethane	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,1-Dichloroethane	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,1-Dichloroethene	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,2,4-Trichlorobenzene	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Benzene, 1,2,4-trimethyl	1.	UJ	1.	U	0.43	J	0.34	J	1.	U	0.35	J
TO-14	Ethylene dibromide	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,2-Dichlorobenzene	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,2-Dichloroethane	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,2-Dichloropropane	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,2-Dichlorotetrafluoroethane	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	cis-1,2-Dichloroethylene	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Benzene, 1,3,5-trimethyl-	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,3-Dichlorobenzene	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,4-Dichlorobenzene	1.	UJ	1.	U	0.39	J	0.28	J	1.	U	0.35	J
TO-14	p-Ethyltoluene	1.	UJ	1.	U	0.38	J	0.3	J	1.	U	0.31	J
TO-14	Allyl chloride	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Benzene	1.	UJ	1.	U	0.34	J	0.3	J	1.	U	0.31	J
TO-14	Benzyl chloride	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Carbon tetrachloride	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Chlorobenzene	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Chloroethane	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Chloroform	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Dichlorodifluoromethane	0.57	J	0.44	J	1.83		1.62		0.35	J	2.06	
TO-14	Ethylbenzene	1.	UJ	1.	U	0.21	J	0.33	J	1.	U	1.	U
TO-14	Hexachlorobutadiene	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Bromomethane	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Chloromethane	1.	UJ	0.29	J	0.39	J	0.42	J	1.	U	0.39	J
TO-14	Methylene chloride	0.29	J	0.42	J	0.69	J	3.88		0.26	J	0.78	J
TO-14	Styrene	1.	R	0.96	J	3.11	J	2.93	J	1.	R	3.16	J
TO-14	Tetrachloroethene	1.	UJ	1.	U	1.16		0.86	J	1.	U	1.55	
TO-14	Toluene	1.91	J	1.82		5.24		4.68		0.34	J	5.27	
TO-14	Trichloroethene	1.	UJ	1.	U	0.24	J	0.21	J	1.	U	0.25	J
TO-14	Trichlorofluoromethane	0.41	J	0.41	J	1.11		1.27		0.38	J	1.27	
TO-14	Trichlorotrifluoroethane (Freon 113)	1.	UJ	1.	U	1.	U	0.5	J	1.	U	1.	U

Method	Parameter												
	SAMPLE ID ------->	656-A-2302-F2		656-A-2304-F2		656-A-2305-F2		656-A-2403-F2		656-A-3104-F2		656-A-3108-F2	
	ORIGINAL ID ----->	656A2302F2		656A2304F2		656A2305F2		656A2403F2		656A3104F2		656A3108F2	
	LAB SAMPLE ID --->	9412185-02		9412185-04		9412185-05		9412185-03		9412186-04		9412186-08	
	ID FROM REPORT -->	656A2302F2		656A2304F2		656A2305F2		656A2403F2		656A3104F2		656A3108F2	
	SAMPLE DATE ----->	12/07/94		12/07/94		12/07/94		12/07/94		12/08/94		12/08/94	
	DATE EXTRACTED -->												
	DATE ANALYZED --->	12/13/94		12/13/94		12/13/94		12/13/94		12/14/94		12/14/94	
	MATRIX ---------->	A		A		A		A		A		A	
	UNITS ----------->	ppbv		ppbv		ppbv		ppbv		ppbv		ppbv	
Method	Parameter	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL
TO-14	1,1,1-Trichloroethane	1.	U	1.	U	1.	UJ	1.	U	0.33	J	0.36	J
TO-14	1,1,2,2-Tetrachloroethane	1.	U	1.	U	1.	UJ	1.	U	1.	U	1.	U
TO-14	1,1,2-Trichloroethane	1.	U	1.	U	1.	UJ	1.	U	1.	U	1.	U
TO-14	1,1-Dichloroethane	1.	U	1.	U	1.	UJ	1.	U	1.	U	1.	U
TO-14	1,1-Dichloroethene	1.	U	1.	U	1.	UJ	1.	U	1.	U	1.	U
TO-14	1,2,4-Trichlorobenzene	1.	U	1.	U	1.	UJ	1.	U	0.23	J	1.	U
TO-14	Benzene, 1,2,4-trimethyl	1.	U	1.	U	1.	UJ	1.	U	0.53	J	0.4	J
TO-14	Ethylene dibromide	1.	U	1.	U	1.	UJ	1.	U	1.	U	1.	U
TO-14	1,2-Dichlorobenzene	1.	U	1.	U	1.	UJ	1.	U	1.	U	1.	U
TO-14	1,2-Dichloroethane	1.	U	1.	U	1.	UJ	1.	U	1.	U	1.	U
TO-14	1,2-Dichloropropane	1.	U	1.	U	1.	UJ	1.	U	1.	U	1.	U
TO-14	1,2-Dichlorotetrafluoroethane	1.	U	1.	U	1.	UJ	1.	U	1.	U	1.	U
TO-14	cis-1,2-Dichloroethylene	1.	U	1.	U	1.	UJ	1.	U	1.	U	1.	U
TO-14	Benzene, 1,3,5-trimethyl-	1.	U	1.	U	1.	UJ	1.	U	0.21	J	1.	U
TO-14	1,3-Dichlorobenzene	1.	U	1.	U	1.	UJ	1.	U	1.	U	1.	U
TO-14	1,4-Dichlorobenzene	1.	U	1.	U	1.	UJ	1.	U	1.	U	0.24	J
TO-14	p-Ethyltoluene	1.	U	1.	U	1.	UJ	1.	U	0.54	J	0.44	J
TO-14	Allyl chloride	1.	U	1.	U	1.	UJ	1.	U	1.	U	1.	U
TO-14	Benzene	1.	U	1.	U	1.	UJ	1.	U	0.29	J	1.	U
TO-14	Benzyl chloride	1.	U	0.21	U	1.	UJ	1.	U	1.	U	1.	U
TO-14	Carbon tetrachloride	1.	U	1.	U	1.	UJ	1.	U	1.	U	1.	U
TO-14	Chlorobenzene	1.	U	1.	U	1.	UJ	1.	U	1.	U	1.	U
TO-14	Chloroethane	1.	U	1.	U	1.	UJ	1.	U	1.	U	1.	U
TO-14	Chloroform	1.	U	1.	U	1.	UJ	1.	U	1.	U	1.	U
TO-14	Dichlorodifluoromethane	0.34	J	0.48	J	0.32	J	0.35	J	0.57	J	1.52	
TO-14	Ethylbenzene	1.	U	1.	U	1.	UJ	1.	U	1.	U	1.	U
TO-14	Hexachlorobutadiene	1.	U	1.	U	1.	UJ	1.	U	1.	U	1.	U
TO-14	Bromomethane	1.	U	1.	U	1.	UJ	1.	U	1.	U	1.	U
TO-14	Chloromethane	0.32	J	1.	U	1.	UJ	0.3	J	0.31	J	0.32	J
TO-14	Methylene chloride	0.25	J	0.48	J	0.34	J	0.29	J	0.52	J	0.32	J
TO-14	Styrene	1.	R	1.	R	1.	R	1,	R	1.	R	1.09	R
TO-14	Tetrachloroethene	1.	U	1.	U	1.	UJ	1.	U	0.26	J	1.04	
TO-14	Toluene	0.48	J	0.23	J	1.	UJ	0.47	J	2.35		1.63	
TO-14	Trichloroethene	1.	U	1.	U	1.	UJ	1.	U	1.	U	1.	U
TO-14	Trichlorofluoromethane	0.36	J	0.61	J	0.36	J	0.4	J	0.51	J	0.63	J
TO-14	Trichlorotrifluoroethane (Freon 113)	1.	U	1.	U	1.	UJ	1.	U	1.	U	1.	U

CHARLESTON - ZONE H
CHARLESTON ZONE H-AIR SAMPLES ONLY

	SAMPLE ID ------->	656-A-2302-F2		656-A-2304-F2		656-A-2305-F2		656-A-2403-F2		656-A-3104-F2		656-A-3108-F2	
	ORIGINAL ID ----->	656A2302F2		656A2304F2		656A2305F2		656A2403F2		656A3104F2		656A3108F2	
	LAB SAMPLE ID --->	9412185-02		9412185-04		9412185-05		9412185-03		9412186-04		9412186-08	
	ID FROM REPORT -->	656A2302F2		656A2304F2		656A2305F2		656A2403F2		656A3104F2		656A3108F2	
	SAMPLE DATE ----->	12/07/94		12/07/94		12/07/94		12/07/94		12/08/94		12/08/94	
	DATE EXTRACTED -->												
	DATE ANALYZED --->	12/13/94		12/13/94		12/13/94		12/13/94		12/14/94		12/14/94	
	MATRIX ---------->	A		A		A		A		A		A	
	UNITS ----------->	ppbv		ppbv		ppbv		ppbv		ppbv		ppbv	
Method	Parameter	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL
TO-14	Vinyl chloride	1.	U	1.	U	1.	UJ	1.	U	1.	U	1.	U
TO-14	cis-1,3-Dichloropropene	1.	U	1.	U	1.	UJ	1.	U	1.	U	1.	U
TO-14	m+p-Xylenes	1.	U	1.	U	1.	UJ	1.	U	0.4	J	0.22	J
TO-14	o-Xylene	1.	U	1.	U	1.	UJ	1.	U	1.	U	1.	U
TO-14	trans-1,3-Dichloropropene	1.	U	1.	U	1.	UJ	1.	U	1.	U	1.	U

	SAMPLE ID ------->	656-A-3206-F2		656-A-3209-F2		656-A-3302-F2		656-A-3303-F2		656-A-3305-F2		656-A-4207-F2	
	ORIGINAL ID ----->	656A3206F2		656A3209F2		656A3302F2		656A3303F2		656A3305F2		656A4207F2	
	LAB SAMPLE ID --->	9412186-06		9412186-09		9412186-02		9412186-03		9412186-05		9412186-07	
	ID FROM REPORT -->	656A3206F2		656A3209F2		656A3302F2		656A3303F2		656A3305F2		656A4207F2	
	SAMPLE DATE ----->	12/08/94		12/08/94		12/08/94		12/08/94		12/08/94		12/08/94	
	DATE EXTRACTED -->												
	DATE ANALYZED --->	12/12/94		12/14/94		12/14/94		12/12/94		12/14/94		12/14/94	
	MATRIX ---------->	A		A		A		A		A		A	
	UNITS ----------->	ppbv		ppbv		ppbv		ppbv		ppbv		ppbv	
Method	Parameter	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL
TO-14	1,1,1-Trichloroethane	0.27	J	0.35	J	0.26	J	0.21	J	0.23	J	0.22	J
TO-14	1,1,2,2-Tetrachloroethane	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	UJ
TO-14	1,1,2-Trichloroethane	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	UJ
TO-14	1,1-Dichloroethane	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	UJ
TO-14	1,1-Dichloroethene	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	UJ
TO-14	1,2,4-Trichlorobenzene	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	UJ
TO-14	Benzene, 1,2,4-trimethyl	1.	U	0.51	J	1.	U	1.	U	1.	UJ	1.	UJ
TO-14	Ethylene dibromide	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	UJ
TO-14	1,2-Dichlorobenzene	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	UJ
TO-14	1,2-Dichloroethane	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	UJ
TO-14	1,2-Dichloropropane	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	UJ
TO-14	1,2-Dichlorotetrafluoroethane	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	UJ
TO-14	cis-1,2-Dichloroethylene	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	UJ
TO-14	Benzene, 1,3,5-trimethyl-	1.	U	0.22	J	1.	U	1.	U	1.	UJ	1.	UJ
TO-14	1,3-Dichlorobenzene	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	UJ
TO-14	1,4-Dichlorobenzene	1.	U	0.26	J	1.	U	1.	U	1.	UJ	1.	UJ
TO-14	p-Ethyltoluene	1.	U	0.55	J	1.	U	1.	U	1.	UJ	1.	UJ
TO-14	Allyl chloride	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	UJ
TO-14	Benzene	1.	U	1.	U	1.	U	0.22	J	1.	UJ	1.	UJ
TO-14	Benzyl chloride	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	UJ
TO-14	Carbon tetrachloride	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	UJ
TO-14	Chlorobenzene	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	UJ
TO-14	Chloroethane	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	UJ
TO-14	Chloroform	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	UJ
TO-14	Dichlorodifluoromethane	0.38	J	1.65		0.34	J	0.37	J	0.34	J	0.36	J
TO-14	Ethylbenzene	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	UJ
TO-14	Hexachlorobutadiene	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	UJ
TO-14	Bromomethane	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	UJ
TO-14	Chloromethane	1.	UJ	0.36	J	1.	UJ	0.29	J	1.	UJ	1.	UJ
TO-14	Methylene chloride	1.	U	0.54	J	0.33	J	0.36	J	0.31	J	0.34	J
TO-14	Styrene	1.	R	1.19	J	1.	R	1.	R	1.	R	1.	R
TO-14	Tetrachloroethene	1.	U	0.96	J	1.	U	1.	U	1.	UJ	1.	UJ
TO-14	Toluene	0.35	J	1.5		1.	U	0.3	J	1.	UJ	1.	UJ
TO-14	Trichloroethene	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	UJ
TO-14	Trichlorofluoromethane	0.37	J	0.75	J	0.45	J	0.45	J	0.42	J	0.4	J
TO-14	Trichlorotrifluoroethane (Freon 113)	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	UJ

CHARLESTON - ZONE H
CHARLESTON ZONE H-AIR SAMPLES ONLY

	SAMPLE ID ------->	656-A-3206-F2		656-A-3209-F2		656-A-3302-F2		656-A-3303-F2		656-A-3305-F2		656-A-4207-F2	
	ORIGINAL ID ----->	656A3206F2		656A3209F2		656A3302F2		656A3303F2		656A3305F2		656A4207F2	
	LAB SAMPLE ID --->	9412186-06		9412186-09		9412186-02		9412186-03		9412186-05		9412186-07	
	ID FROM REPORT -->	656A3206F2		656A3209F2		656A3302F2		656A3303F2		656A3305F2		656A4207F2	
	SAMPLE DATE ----->	12/08/94		12/08/94		12/08/94		12/08/94		12/08/94		12/08/94	
	DATE EXTRACTED -->												
	DATE ANALYZED --->	12/12/94		12/14/94		12/14/94		12/12/94		12/14/94		12/14/94	
	MATRIX ---------->	A		A		A		A		A		A	
	UNITS ----------->	ppbv		ppbv		ppbv		ppbv		ppbv		ppbv	
Method	Parameter	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL
TO-14	Vinyl chloride	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	UJ
TO-14	cis-1,3-Dichloropropene	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	UJ
TO-14	m+p-Xylenes	1.	U	0.23	J	1.	U	1.	U	1.	UJ	1.	UJ
TO-14	o-Xylene	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	UJ
TO-14	trans-1,3-Dichloropropene	1.	U	1.	U	1.	U	1.	U	1.	UJ	1.	UJ

CHARLESTON - ZONE H
CHARLESTON ZONE H-AIR SAMPLES ONLY

	SAMPLE ID ------->	657-A-1105-F2		657-A-1204-F2		657-A-1306-F2		657-A-2106-F2		657-A-2207-F2		657-A-2308-F2	
	ORIGINAL ID ----->	657A1105F2		657A1204F2		657A1306F2		657A2106F2		657A2207F2		657A2308F2	
	LAB SAMPLE ID --->	9411411-05		9411411-04		9411411-06		9411538-06		9411538-07		9411538-08	
	ID FROM REPORT -->	657A1105F2		657A1204F2		657A1306F2		657A2106F2		657A2207F2		657A2308F2	
	SAMPLE DATE ----->	11/18/94		11/18/94		11/18/94		11/29/94		11/29/94		11/29/94	
	DATE EXTRACTED -->												
	DATE ANALYZED --->	11/21/94		11/20/94		11/21/94		12/01/94		12/01/94		12/02/94	
	MATRIX ---------->	A		A		A		A		A		A	
	UNITS ----------->	ppbv		ppbv		ppbv		ppbv		ppbv		ppbv	
Method	Parameter	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL
TO-14	1,1,1-Trichloroethane	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,1,2,2-Tetrachloroethane	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,1,2-Trichloroethane	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,1-Dichloroethane	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,1-Dichloroethene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,2,4-Trichlorobenzene	0.22	J	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Benzene, 1,2,4-trimethyl	0.22	J	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Ethylene dibromide	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,2-Dichlorobenzene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,2-Dichloroethane	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,2-Dichloropropane	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,2-Dichlorotetrafluoroethane	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	cis-1,2-Dichloroethylene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Benzene, 1,3,5-trimethyl-	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,3-Dichlorobenzene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,4-Dichlorobenzene	19.		1.	U	0.21	J	22.5		0.44	J	1.	U
TO-14	p-Ethyltoluene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Allyl chloride	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Benzene	0.22	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Benzyl chloride	1.	UJ	1.	U	1.	UJ	1.	U	1.	U	1.	U
TO-14	Carbon tetrachloride	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Chlorobenzene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Chloroethane	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Chloroform	1.	U	1.	U	1.	U	0.23	J	1.	U	1.	U
0-14	Dichlorodifluoromethane	1.07		0.39	J	0.3	J	0.96	J	0.27	J	0.38	J
0-14	Ethylbenzene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
0-14	Hexachlorobutadiene	1.	UJ	1.	UJ	1.	UJ	1.	U	1.	U	1.	U
0-14	Bromomethane	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
0-14	Chloromethane	0.45	U	0.24	U	0.32	U	0.27	J	1.	U	1.	U
0-14	Methylene chloride	0.5	U	0.38	U	0.33	U	0.57	U	0.22	U	0.26	U
0-14	Styrene	1.	R	1.	R	1.	R	1.	J	1.	R	1.	R
0-14	Tetrachloroethene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
0-14	Toluene	0.48	J	0.26	J	0.33	J	0.39	J	1.	U	0.24	J
0-14	Trichloroethene	1.	U	1.	UJ	1.	U	1.	U	1.	U	1.	U
0-14	Trichlorofluoromethane	12.6		0.28	J	0.24	J	4.37		0.79	J	2.19	J
0-14	Trichlorotrifluoroethane (Freon 113)	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U

	SAMPLE ID ------->	657-A-1105-F2		657-A-1204-F2		657-A-1306-F2		657-A-2106-F2		657-A-2207-F2		657-A-2308-F2	
	ORIGINAL ID ----->	657A1105F2		657A1204F2		657A1306F2		657A2106F2		657A2207F2		657A2308F2	
	LAB SAMPLE ID --->	9411411-05		9411411-04		9411411-06		9411538-06		9411538-07		9411538-08	
	ID FROM REPORT -->	657A1105F2		657A1204F2		657A1306F2		657A2106F2		657A2207F2		657A2308F2	
	SAMPLE DATE ----->	11/18/94		11/18/94		11/18/94		11/29/94		11/29/94		11/29/94	
	DATE EXTRACTED -->												
	DATE ANALYZED --->	11/21/94		11/20/94		11/21/94		12/01/94		12/01/94		12/02/94	
	MATRIX ---------->	A		A		A		A		A		A	
	UNITS ----------->	ppbv		ppbv		ppbv		ppbv		ppbv		ppbv	
Method	Parameter	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL
TO-14	Vinyl chloride	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	cis-1,3-Dichloropropene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	m+p-Xylenes	0.43	J	1.	U	0.29	J	0.26	J	1.	U	1.	U
TO-14	o-Xylene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	trans-1,3-Dichloropropene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U

	657-A-3105-F2	657-A-3206-F2	657-A-3207-F2	657-A-3308-F2	CAN-A-8840-00	N84-A-1101-F2
SAMPLE ID ------->	657-A-3105-F2	657-A-3206-F2	657-A-3207-F2	657-A-3308-F2	CAN-A-8840-00	N84-A-1101-F2
ORIGINAL ID ----->	657A3105F2	657A3206F2	657A3207F2	657A3308F2	Can#8840	N84A1101F2
LAB SAMPLE ID --->	9411567-05	9411567-06	9411567-07	9411567-08	9411411-03	9411411-01
ID FROM REPORT -->	657A3105F2	657A3206F2	657A3207F2	657A3308F2	Can#8840	N84A1101F2
SAMPLE DATE ----->	11/30/94	11/30/94	11/30/94	11/30/94	11/18/94	11/18/94
DATE EXTRACTED -->						
DATE ANALYZED --->	12/02/94	12/02/94	12/02/94	12/02/94	11/20/94	11/20/94
MATRIX ---------->	A	A	A	A	A	A
UNITS ----------->	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv

Method	Parameter	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL
TO-14	1,1,1-Trichloroethane	1.	U	1.	U	1.	U	1.	U	1.15	J	0.45	J
TO-14	1,1,2,2-Tetrachloroethane	1.	U	1.	U	1.	U	1.	U	5.	U	1.	U
TO-14	1,1,2-Trichloroethane	1.	U	1.	U	1.	U	1.	U	5.	U	1.	U
TO-14	1,1-Dichloroethane	1.	U	1.	U	1.	U	1.	U	5.	U	1.	U
TO-14	1,1-Dichloroethene	1.	U	1.	U	1.	U	1.	U	5.	U	1.	U
TO-14	1,2,4-Trichlorobenzene	1.	U	1.	U	1.	U	1.	U	5.	U	1.	U
TO-14	Benzene, 1,2,4-trimethyl	1.	U	1.	U	1.	U	1.	U	247.	J	1.	U
TO-14	Ethylene dibromide	1.	U	1.	U	1.	U	1.	U	5.	U	1.	U
TO-14	1,2-Dichlorobenzene	1.	U	1.	U	1.	U	1.	U	5.	U	1.	U
TO-14	1,2-Dichloroethane	1.	U	1.	U	1.	U	1.	U	5.	U	1.	U
TO-14	1,2-Dichloropropane	1.	U	1.	U	1.	U	1.	U	5.	U	1.	U
TO-14	1,2-Dichlorotetrafluoroethane	1.	U	1.	U	1.	U	1.	U	5.	U	1.	U
TO-14	cis-1,2-Dichloroethylene	1.	U	1.	U	1.	U	1.	U	5.	U	1.	U
TO-14	Benzene, 1,3,5-trimethyl-	1.	U	1.	U	1.	U	1.	U	94.5	J	1.	U
TO-14	1,3-Dichlorobenzene	1.	U	1.	U	1.	U	1.	U	5.	U	1.	U
TO-14	1,4-Dichlorobenzene	13.		1.	U	0.71	J	1.	U	5.	U	1.	U
TO-14	p-Ethyltoluene	1.	U	1.	U	1.	U	1.	U	170.	J	1.	U
TO-14	Allyl chloride	1.	U	1.	U	1.	U	1.	U	5.	U	1.	U
TO-14	Benzene	1.	U	1.	U	1.	U	1.	U	5.	U	1.	U
TO-14	Benzyl chloride	1.	U	1.	U	1.	U	1.	U	5.	UJ	1.	U
TO-14	Carbon tetrachloride	1.	U	1.	U	1.	U	1.	U	5.	U	1.	U
TO-14	Chlorobenzene	1.	U	1.	U	1.	U	1.	U	5.	U	1.	U
TO-14	Chloroethane	1.	U	1.	U	1.	U	1.	U	5.	U	1.	U
TO-14	Chloroform	1.	U	1.	U	1.	U	1.	U	1.35	J	1.	U
TO-14	Dichlorodifluoromethane	0.67	J	0.36	J	0.39	J	0.35	J	5.	U	0.27	J
TO-14	Ethylbenzene	1.	U	1.	U	1.	U	1.	U	62.2	J	1.	U
TO-14	Hexachlorobutadiene	1.	U	1.	U	1.	U	1.	U	5.	UJ	1.	UJ
TO-14	Bromomethane	1.	U	1.	U	1.	U	1.	U	5.	U	1.	U
TO-14	Chloromethane	0.21	J	1.	U	1.	U	1.	U	5.	U	0.29	U
TO-14	Methylene chloride	0.85	U	0.54	U	1.54	U	0.44	U	19.5	J	0.38	U
TO-14	Styrene	0.44	J	1.	R	1.	R	1.	R	167.	J	1.	R
TO-14	Tetrachloroethene	1.	U	1.	U	1.	U	1.	U	5.	U	1.	U
TO-14	Toluene	0.33	J	1.	U	1.	U	1.	U	15.3	J	0.45	J
TO-14	Trichloroethene	1.	U	1.	U	1.	U	1.	U	5.	U	1.	UJ
TO-14	Trichlorofluoromethane	2.64	J	0.31	J	0.48	J	0.3	J	2.65	J	0.52	J
TO-14	Trichlorotrifluoroethane (Freon 113)	1.	U	1.	U	1.	U	1.	U	7.6	J	1.	U

CHARLESTON - ZONE H
CHARLESTON ZONE H-AIR SAMPLES ONLY

	SAMPLE ID ------->	657-A-3105-F2		657-A-3206-F2		657-A-3207-F2		657-A-3308-F2		CAN-A-8840-00		N84-A-1101-F2	
	ORIGINAL ID ----->	657A3105F2		657A3206F2		657A3207F2		657A3308F2		Can#8840		N84A1101F2	
	LAB SAMPLE ID --->	9411567-05		9411567-06		9411567-07		9411567-08		9411411-03		9411411-01	
	ID FROM REPORT -->	657A3105F2		657A3206F2		657A3207F2		657A3308F2		Can#8840		N84A1101F2	
	SAMPLE DATE ----->	11/30/94		11/30/94		11/30/94		11/30/94		11/18/94		11/18/94	
	DATE EXTRACTED -->												
	DATE ANALYZED --->	12/02/94		12/02/94		12/02/94		12/02/94		11/20/94		11/20/94	
	MATRIX ---------->	A		A		A		A		A		A	
	UNITS ----------->	ppbv		ppbv		ppbv		ppbv		ppbv		ppbv	
Method	Parameter	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL
TO-14	Vinyl chloride	1.	U	1.	U	1.	U	1.	U	5.	U	1.	U
TO-14	cis-1,3-Dichloropropene	1.	U	1.	U	1.	U	1.	U	5.	U	1.	U
TO-14	m+p-Xylenes	1.	U	1.	U	1.	U	1.	U	385.	J	0.48	J
TO-14	o-Xylene	1.	U	1.	U	1.	U	1.	U	181.	J	1.	U
TO-14	trans-1,3-Dichloropropene	1.	U	1.	U	1.	U	1.	U	5.	U	1.	U

	SAMPLE ID ------->	N84-A-1202-F2		N84-A-1303-F2		N84-A-2202-F2		N84-A-2204-F2		N84-A-2305-F2		N84-A-3102-F2	
	ORIGINAL ID ----->	N84A1202F2		N84A1303F2		N84A2202F2		N84A2204F2		N84A2305F2		N84A3102F2	
	LAB SAMPLE ID --->	9411411-02		9411411-09		9411538-02		9411538-04		9411538-05		9411567-02	
	ID FROM REPORT -->	N84A1202F2		N84A1303F2		N84A2202F2		N84A2204F2		N84A2305F2		N84A3102F2	
	SAMPLE DATE ----->	11/18/94		11/18/94		11/29/94		11/29/94		11/29/94		11/30/94	
	DATE EXTRACTED -->												
	DATE ANALYZED --->	11/20/94		11/21/94		12/01/94		12/01/94		12/02/94		12/02/94	
	MATRIX ---------->	A		A		A		A		A		A	
	UNITS ----------->	ppbv		ppbv		ppbv		ppbv		ppbv		ppbv	
Method	Parameter	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL
TO-14	1,1,1-Trichloroethane	1.	U	1.	U	0.29	J	1.	U	1.	U	0.45	J
TO-14	1,1,2,2-Tetrachloroethane	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,1,2-Trichloroethane	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,1-Dichloroethane	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,1-Dichloroethene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,2,4-Trichlorobenzene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Benzene, 1,2,4-trimethyl	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Ethylene dibromide	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,2-Dichlorobenzene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,2-Dichloroethane	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,2-Dichloropropane	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,2-Dichlorotetrafluoroethane	0.21	J	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	cis-1,2-Dichloroethylene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Benzene, 1,3,5-trimethyl-	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,3-Dichlorobenzene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	1,4-Dichlorobenzene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	p-Ethyltoluene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Allyl chloride	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Benzene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Benzyl chloride	1.	U	1.	UJ	1.	U	1.	U	1.	U	1.	U
TO-14	Carbon tetrachloride	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Chlorobenzene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Chloroethane	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Chloroform	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Dichlorodifluoromethane	0.26	J	1.	U	0.26	J	0.26	J	0.37	J	0.36	J
TO-14	Ethylbenzene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Hexachlorobutadiene	1.	UJ	1.	UJ	1.	U	1.	U	1.	U	1.	U
TO-14	Bromomethane	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Chloromethane	0.28	U	1.	U	0.27	J	1.	U	0.38	J	0.34	J
TO-14	Methylene chloride	0.28	U	1.	U	0.27	U	0.25	U	0.38	U	0.62	U
TO-14	Styrene	1.	R	1.	R	0.86	J	1.	R	1.	R	1.	R
TO-14	Tetrachloroethene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Toluene	0.32	J	1.	U	0.39	J	1.	U	0.26	J	0.48	J
TO-14	Trichloroethene	1.	UJ	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	Trichlorofluoromethane	1.	UJ	1.	U	0.52	J	1.	U	0.3	J	0.52	J
TO-14	Trichlorotrifluoroethane (Freon 113)	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U

	SAMPLE ID -------->	N84-A-1202-F2		N84-A-1303-F2		N84-A-2202-F2		N84-A-2204-F2		N84-A-2305-F2		N84-A-3102-F2	
	ORIGINAL ID ----->	N84A1202F2		N84A1303F2		N84A2202F2		N84A2204F2		N84A2305F2		N84A3102F2	
	LAB SAMPLE ID --->	9411411-02		9411411-09		9411538-02		9411538-04		9411538-05		9411567-02	
	ID FROM REPORT -->	N84A1202F2		N84A1303F2		N84A2202F2		N84A2204F2		N84A2305F2		N84A3102F2	
	SAMPLE DATE ----->	11/18/94		11/18/94		11/29/94		11/29/94		11/29/94		11/30/94	
	DATE EXTRACTED -->												
	DATE ANALYZED --->	11/20/94		11/21/94		12/01/94		12/01/94		12/02/94		12/02/94	
	MATRIX ---------->	A		A		A		A		A		A	
	UNITS ----------->	ppbv		ppbv		ppbv		ppbv		ppbv		ppbv	
Method	Parameter	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL	AIR	VAL
TO-14	Vinyl chloride	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	cis-1,3-Dichloropropene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	m+p-Xylenes	0.61	J	1.	U	0.2	J	1.	U	1.	U	1.	U
TO-14	o-Xylene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U
TO-14	trans-1,3-Dichloropropene	1.	U	1.	U	1.	U	1.	U	1.	U	1.	U

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	SAMPLE ID ------->	N84-A-3203-F2		N84-A-3304-F2	
	ORIGINAL ID ----->	N84A3203F2		N84A3304F2	
	LAB SAMPLE ID --->	9411567-03		9411567-04	
	ID FROM REPORT -->	N84A3203F2		N84A3304F2	
	SAMPLE DATE ----->	11/30/94		11/30/94	
	DATE EXTRACTED -->				
	DATE ANALYZED --->	12/02/94		12/02/94	
	MATRIX ---------->	A		A	
	UNITS ----------->	ppbv		ppbv	
Method	Parameter	AIR	VAL	AIR	VAL
TO-14	1,1,1-Trichloroethane	1.	U	1.	U
TO-14	1,1,2,2-Tetrachloroethane	1.	U	1.	U
TO-14	1,1,2-Trichloroethane	1.	U	1.	U
TO-14	1,1-Dichloroethane	1.	U	1.	U
TO-14	1,1-Dichloroethene	1.	U	1.	U
TO-14	1,2,4-Trichlorobenzene	1.	U	1.	U
TO-14	Benzene, 1,2,4-trimethyl	1.	U	1.	U
TO-14	Ethylene dibromide	1.	U	1.	U
TO-14	1,2-Dichlorobenzene	1.	U	1.	U
TO-14	1,2-Dichloroethane	1.	U	1.	U
TO-14	1,2-Dichloropropane	1.	U	1.	U
TO-14	1,2-Dichlorotetrafluoroethane	1.	U	1.	U
TO-14	cis-1,2-Dichloroethylene	1.	U	1.	U
TO-14	Benzene, 1,3,5-trimethyl-	1.	U	1.	U
TO-14	1,3-Dichlorobenzene	1.	U	1.	U
TO-14	1,4-Dichlorobenzene	1.	U	1.	U
TO-14	p-Ethyltoluene	1.	U	1.	U
TO-14	Allyl chloride	1.	U	1.	U
TO-14	Benzene	1.	U	1.	U
TO-14	Benzyl chloride	1.	U	1.	U
TO-14	Carbon tetrachloride	1.	U	1.	U
TO-14	Chlorobenzene	1.	U	1.	U
0-14	Chloroethane	1.	U	1.	U
0-14	Chloroform	1.	U	1.	U
0-14	Dichlorodifluoromethane	0.38	J	0.34	J
0-14	Ethylbenzene	1.	U	1.	U
0-14	Hexachlorobutadiene	1.	U	1.	U
0-14	Bromomethane	1.	U	1.	U
0-14	Chloromethane	0.3	J	1.	U
0-14	Methylene chloride	0.77	U	0.84	U
0-14	Styrene	1.	R	1.	R
0-14	Tetrachloroethene	1.	U	1.	U
0-14	Toluene	0.26	J	1.	U
0-14	Trichloroethene	1.	U	1.	U
0-14	Trichlorofluoromethane	0.31	J	0.27	J
0-14	Trichlorotrifluoroethane (Freon 113)	1.	U	1.	U

	SAMPLE ID ------->	N84-A-3203-F2		N84-A-3304-F2	
	ORIGINAL ID ----->	N84A3203F2		N84A3304F2	
	LAB SAMPLE ID --->	9411567-03		9411567-04	
	ID FROM REPORT -->	N84A3203F2		N84A3304F2	
	SAMPLE DATE ----->	11/30/94		11/30/94	
	DATE EXTRACTED -->				
	DATE ANALYZED --->	12/02/94		12/02/94	
	MATRIX ---------->	A		A	
	UNITS ----------->	ppbv		ppbv	
Method	Parameter	AIR	VAL	AIR	VAL
TO-14	Vinyl chloride	1.	U	1.	U
TO-14	cis-1,3-Dichloropropene	1.	U	1.	U
TO-14	m+p-Xylenes	0.41	J	1.	U
TO-14	o-Xylene	1.	U	1.	U
TO-14	trans-1,3-Dichloropropene	1.	U	1.	U

APPENDIX C

**Standard Operating Procedure for
The Determination of Volatile Organic Compounds (VOCs)
In Ambient Air Using SUMMA Passivated Canister Sampling and GC/MS Analysis**

STANDARD OPERATING PROCEDURE

FOR

THE DETERMINATION OF VOLATILE ORGANIC COMPOUNDS (VOCs) IN AMBIENT AIR USING SUMMA PASSIVATED CANISTER SAMPLING AND GC/MS ANALYSIS

APPLICABLE TO COMPENDIUM METHOD TO-14

HARD COPY ORIGINAL REPOSITORY:

NOTE: This Standard Operating Procedure has been prepared for the sole use of General Engineering Laboratories, Inc. and its affiliates and may not be specifically applicable to the activities of other organizations.

Process Owner(s):	Mahmoud Karimipour, Analyst
Technical Review by:	Linda Darrington, Senior Chemist
Quality Review by:	Melinda Dilda, Quality Assessor
Approved and Authorized by:	James T. Chambers, Laboratory Manager

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3.0 METHOD OBJECTIVE AND PURPOSE

This procedure describes the determination of volatile organic compounds (VOCs) in ambient air, indoor air, landfill gases and other gaseous samples. This method is based on collection of whole air samples in summa passivated stainless steel canisters. The VOCs are absorbed onto a cryogenic trap, desorbed to a cryofocusing device and then separated via the gas chromatograph (GC) and selected using a mass spectrometer (MS). This procedure applies to both pressurized and subatmospheric pressure sampling.

4.0 METHOD APPLICABILITY AND METHOD SUMMARY

4.1 Analytes - See Appendix 1

4.2 Applicable Matrices - Ambient air, indoor air, landfill gases, and other gas samples.

4.3 General Method Summary - Method TO-14 is used to quantitate VOCs in pressurized, atmospheric pressure, and subatmospheric pressure that are insoluble (non polar) or slightly soluble (polar) in water. A precisely measured aliquot, 200 ml, is removed from the canister, passed through a Nafion permeable dryer to remove water vapor, and concentrated on a cryogenic trap at -150° C. The trap is thermally desorbed at 150° C and the analytes are refocused on a cryofocusing trap at the head of the GC column at -190° GC and detected with a quadrupole mass spectrometer.

4.4 Definitions

4.4.1 Absolute canister pressure - It is equal to $P_g + P_a$, where P_g = gauge pressure in the canister (KPa, Psi) and P_a = barometric pressure.

4.4.2 Absolute pressure - Pressure measured with reference to absolute zero pressure, expressed as KPa, mmHg, or Psia.

4.4.3 Cryogen - A refrigerant, liquid nitrogen, used to obtain very low temperatures in the cryogenic trap of the analytical system.

4.4.4 Dynamic calibration - Calibration of analytical system, using calibration gas standard concentrations, in a form identical or very similar to the samples to be analyzed and by introducing such standard into the inlet of sampling or analytical system in a manner very similar to the normal sampling or analytical process.

4.4.5 Gauge pressure - Pressure measured above ambient atmospheric pressure (as opposed to absolute pressure). Zero gauge pressure is equal to ambient atmospheric pressure (barometric) pressure.

4.4.6 Pressurized sampling - Collection of an air sample in a canister with a (final) canister pressure above atmospheric pressure, using a sample pump.

4.4.7 Static calibration - Calibration of an analytical system, using standards in a form different than the samples to be analyzed.

4.4.8 Subatmospheric sampling - Collection of an air sample in an evacuated canister at a (final) canister pressure below atmospheric pressure.

4.5 Method Codes - EPA TO-14

5.0 METHOD SCOPE AND PERFORMANCE CHARACTERISTICS

5.1 Calibration Range:

5.1.1 ppbv to 50 ppbv for all compounds listed in Appendix 1.

5.2 Method detection limit studies are performed annually and are kept in the volatile section.

6.0 REFERENCES

6.1 EPA TO-14 Compendium, May, 1988.

7.0 INTERFERENCES TO THE METHOD

7.1 Interferences can occur in sample analysis if moisture is accumulated in the Nafion dryer. By heating the nafion dryer to about 100° C, while purging with zero air, eliminates any moisture buildup.

7.2 Contamination may occur in the sampling system if canisters are not properly cleaned before use.

8.0 SAFETY PRECAUTIONS AND HAZARD WARNINGS

Each compound and solvent should be treated as a potential health hazard. It is highly recommended that individuals read the Material Safety Data Sheets (MSDS), before handling any of the chemicals involved with this procedure. MSDS can be found on file at the purchasing agent's desk. Safety equipment such as gloves and glasses are worn when handling samples and standards. Fume hoods and respirators are used when highly concentrated or particularly noxious substances are dealt with. In case of an accident, seek help immediately and report the event, regardless of how insignificant it may seem.

9.0 CAUTION WARNINGS

The analyst should use great care when operating and assembling instrumentation and when handling samples and reagents. Great care should also be taken to avoid running samples that contain overrange hits of analytes, especially hydrocarbons. Samples must be stored at room temperature away from standards. Sample dilution is made with zero grade air.

10.0 APPARATUS AND MATERIALS; REAGENTS; EQUIPMENT AND INSTRUMENTS

10.1 Ancillary Equipment

10.1.1 Canisters, 6 Liter sizes, preferably equipped with two valves and integral vacuum/pressure gauge.

10.1.2 Static dilution bottles, 2000 mL, with mininert valves.

10.1.3 Septum sealed vials and replacement septa.

10.1.4 Gas tight syringe. 1, 10, 25, 50, 100, 500, and 1000 µl or 2.5 and 50 mL.

10.1.5 Mercury barometer, Baxter scientific or equivalent.

10.1.6 Mercury menometer, Baxter scientific or equivalent.

10.1.7 Column. J and W DB 624 fused silica capillary column 0.32 mm ID x 60 m, 1.8 µm film thickness (P/N 123-1364).

10.1.8 Glass humidifier, impinger type with at least an 8 inch water column filled with boiled deionized water.

10.1.9 Stainless steel vacuum/pressure gauge capable of measuring vacuum (-100 to 0 Kpa or 0 to 30 in Hg) and pressure (0-700 KPa or 0 to 100 Psig).

10.2 Reagents

10.2.1 Helium, ultra high purity, 99.999 + %

10.2.2 Air, zero grade air

10.2.3 Liquid nitrogen, 22 Psig. Low pressure

10.2.4 Source standard solutions: Standards are purchased in certified high-pressure aluminum cylinders at ppmv from either alpha or Scott specialty gases.

10.2.5 Internal/Surrogate standards: Bromochloromethane, 1,4-diflurobenzene, chlorobenzene-ds at 10 ppmv and bromofluorobenzene at 4 ppmv level in nitrogen, 200 psig, Scott specialty gases or alpha.

10.3 Instrumentation:

10.3.1 Cryogenic concentration system manufactured by Graseby NuTech. This system consists of three parts, 3550A cryogenic concentrator, model 3600 VOC autosampler, and model 354 A cryofocusing accessory.

10.3.1.1 The model 3550 A is designed for maximum sample volume with or without the sample dryer.

10.3.1.2 The model 3600 VOC autosampler is capable of automatically concentrating 16 air samples unattended.

10.3.1.3 The 354 A cryofocusing accessory refocuses the sample at the head of the capillary column, further reducing the sample volume to less than one microliter for injection.

Recommended Parameters:

10.3.1.4 For all running method parameters refer to Graseby NuTech 3550 A cryogenic concentrator operating manual, Version 2.0, December 1993, pg. 30.

10.3.2 GC/MS System

10.3.2.1 This device consists of HP Gas Chromatograph 5890 series II, and Mass Selective Detector 5972, capable of scanning from 10 to 800 amu using 70 electron volts in the ionization mode. A HP G1034c MS chemstation Software Data System is used to control or assist in instrument tuning, data acquisition, data reduction, report production, and automation.

10.3.2.2 The type of column to use is:

10.3.2.3 DB 624, 60 m X 0.32 mm ID

10.3.2.4 Film Thickness: 1.8 microns

10.3.2.5 Temperature Limits: -20° C to 260° C

10.3.2.6 Temperature Program: Parameters are listed below.

10.3.2.7 Temp 1: 35° C

10.3.2.8 Time 1: 4 minutes

10.3.2.9 Rate 1: 8° C/minutes

10.3.2.10 Temp 2: 200° C

10.3.2.11 Time 3: 2.3 minutes

10.3.2.12 Scan Range: 35 to 280 m/z

10.3.2.13 Manifold: 250°C

11.0 SAMPLE HANDLING AND PRESERVATION REQUIREMENTS

11.1 All samples must be stored at room temperature from the time of collection until analysis.

11.2 Initial pressure in the canister must be checked and recorded on a canister sampling field data sheet prior to sampling and final pressure must be checked and recorded after the sampling time in the field.

11.3 The analyst must check the canister pressure for leak and record it on a canister log sheet. A copy of the sheet is shown in Appendix 2. If there is any pressure difference above 10% from the original pressure recorded, the integrity of the sample is suspect and the data must be flagged with a "p".

11.4 There is no preservative or holding time specified.

12.0 SAMPLE PREPARATION TECHNIQUES

12.1 The samples are allowed to equilibrate at ambient temperature and are then analyzed. It may be necessary to dilute and pressurize samples prior to analysis.

12.1.1 The canister is connected to a NIST certified vacuum gauge. Using an oil-less vacuum pump, all air is removed from the line connecting the canister and monometer. Once a stable vacuum level has been achieved, as monitored by a test gauge, the pump is isolated from the system.

12.1.2 The canister is opened and the pressure on the gauge is recorded.

12.1.3 The canister is connected to the gas supply. The gas is allowed to thoroughly purge the line and canister fitting. The fitting is tightened.

12.1.4 The canister valve is opened and the canister is pressurized to approximately the desired pressure. The exact pressure is recorded and the canister valve is closed.

12.1.5 If the sample is to be analyzed for nonplar only, the canister can be pressurized with air purged through the humidifier. If the sample is to be analyzed for polar compounds, the canister is pressurized with dry zero air to approximately 10 Psig.

NOTE: The lower pressure is necessary to avoid making the sample too dry.

12.1.6 The gas supply line is capped.

12.1.7 The barometric pressure is recorded.

12.1.8 The dilution factor is calculated according to section 12.3.

12.2 High level samples - Highly concentration samples or those with high levels of methane or carbon dioxide may require small sample sizes. Samples smaller than 20 mL/min cannot be accurately metered by the mass flow controller of the NuTech system. Although the NuTech system is equipped with high level sample loop, 5 ml to handle ppm level concentrations, high level canisters are serial diluted as follows:

12.2.1 The original sample canister is diluted as described in 12.1 to 40 Psig and allowed to equilibrate for at least 12 hours.

12.2.2 The original canister is vented until the pressure is less than 15 Psig.

12.2.3 A septum nut is attached to the original canister and to a clean, certified, and evacuated 6 liter canister. A 50 mL gas-tight syringe is purged with helium.

12.2.4 The syringe is purged twice with sample and vented. It is then used to withdraw exactly 50 mL of the original sample and allowed to vent to atmospheric pressure.

12.2.5 The 50 mL aliquot is transferred to the evacuated canister.

12.2.6 The evacuated canister is pressurized to 40 Psig with humidified air as described in section 12.1.5.

12.2.7 Samples receiving only nonpolar analysis are diluted with humidified zero air. Those receiving analysis for polar compounds are spiked with 200 µL of boiled deionized water after the 50 mL aliquot is transferred. The canister is then diluted with dry zero air to 40 Psig.

12.2.8 All data for serial dilution's are recorded.

12.2.9 The serial diluted samples can be analyzed as a low level sample.

12.2.10 The serial dilution factor is calculated according to section 12.3.

12.3 Calculations

12.3.1 Legend:

cc = concentration in canister, ppbv/v
c_X = value determined by vendor certification analysis is used
d = density
DF = Dilution Factor, unitless
FVcan = Final Volume, liters, a pressurized canister
GC = Gas constant at 21° C, 24.2 nL/n mole
MW = Molecular weight, ng/n mole
P_B = Pressure barometric
P_F = Final pressure
P_I = Initial pressure
P_T = Transferred pressure
P_X = Pressure; X = inches, psia, mmHg
TK = Temperature in Kelvin
TV_X = Transfer volume, liters, μL

12.3.2

$$FV = 0.386 \text{ x } (33 \text{ or } 6 \text{ L}) \text{ x } \left[\frac{PB,\text{mmHg} + (P_{psi} \times 51.7149)}{TK}\right]$$

Where:

0.386 is standard temperature and pressure,
293K/760mmHg 1.7149 mmHg/psi is the conversion factor between mmHg and Psig
TK = 273 + temperature in Celsius degrees

12.3.3

$$PmmHg = 25.4 \text{ x P inches}$$

12.3.4 Concentration of cylinder standards

Concentration of nonpolar analytes in primary target standard

$$\text{cc, ppb v/v} = \frac{(P_T - P_I, Psi)(Cx)}{(P_F, Psi + PB, Psi)}$$

12.3.5 Concentration of cylinder standards

$$\text{cc ppb v/v} = \frac{(P_T - T_I)(CC)}{(P_F + P_B, Psi)}$$

cc is the concentration of the primary target standard

12.3.6 Dilution factor of original sample canisters

$$DF = \frac{(P_f + P_B)}{(P_i + P_B)}$$

12.3.7 Serial dilution factor

$$DF = FV/TV$$

12.3.8 Sample quantitation - The amount of target compound detected is determined using the daily RF values:

$$\text{Amount} = \frac{A_x x Cis x DF}{Ais x RF x S}$$

Where:

S = Sample size, liters

12.3.9 Unit Conversions

$$\text{Amount, } \mu g/m^3 = \frac{\text{Amount, ppbxMW}}{GC}$$

12.3.10 $\text{Amount, ppmv/v} = \text{Amount, } \frac{\text{ppbv / v}}{1000}$

13.0 EQUIPMENT AND INSTRUMENT MAINTENANCE

ROUTINE PREVENTATIVE AND SPECIAL OPERATIONAL (FAILURE)

13.1 Preventative maintenance on a GC/MS System involves four basic areas as described in Hewlett Packard Hardware Manual P/N 05970-90049 and P/N 05972-90001.

13.1.1 Vacuum pumps for the analyzer need a change of oil every six months. This includes both the mechanical, turbomolecular, and/or diffusion pumps.

13.1.2 GC maintenance as described for Hewlett Packard Gas Chromatographs in reference manual P/N 05890-90260 consists mainly of column and injection port maintenance. These procedures should be performed when system sensitivity drops or air ($m/z = 28$) is noted present in the system.

13.1.3 Analyzer maintenance is most often usage dependent. The type and quantity of samples that have been injected determines the frequency of ion source and electron multiplier cleaning and/or replacement.

13.1.4 Autosampler, NuTech, maintenance is described fully in the Graseby NuTech manual. Version 2.0 Dec., 1993.

13.2 Routine Preventative Maintenance (PM) Procedures

13.2.1 Preventive maintenance consists mainly of baking the gas chromatograph columns following the analysis of samples. The oven should be ramped to 100° C and left there overnight. Refer to Section 13.1 for other maintenance procedures.

13.3 Non-routine Maintenance Procedures (Special, Operational or Failure Mode Maintenance)

13.3.1 Troubleshooting the autosampler and instrument is a function of analyst experience. There are literally dozens, if not hundreds, of possible reasons for why the instruments do not operate efficiently and properly. In-house service is obtained from GEL's Instrument Service Engineer. If vendor assistance is needed, either Hewlett-Packard, or Graseby NuTech is contacted.

13.4 Maintenance logbooks are kept for each instrument and include entries for both routine as well as non-routine maintenance procedures.

14.0 PREPARATION OF STANDARD SOLUTION AND QUALITY CONTROL SAMPLES

14.0.1 Internal/Surrogate Standards: Bromochloromethane, 1,4-diflurobenzene, chlorobenzene-d5 at 10 ppmv and bromoflurorbenzene at 4 ppmv level in nitrogen purchased from Scott specialty gases in high-pressure aluminum cylinders. The final concentration of these standards are 25 ppbv and 15 ppbv respectively.

14.1 The standards logbook is used to inventory and record all of the standards. For guidance on standard documentation refer to SOP GL-LB-E-007 for Laboratory Standard Documentation.

15.0 INSTRUMENT CALIBRATION

15.1 Prior to running a multi-point calibration, precautions are taken to ensure that the instrument is clean and functioning properly. A minimum of five levels are run, usually 2, 5, 10, 20, and 50 ppbv. It is suggested that the standards be set up from low to high in order to prevent carry over.

15.1.1 The mass spectrometric is scanned from 10 to 50 amu as a leak check of the vacuum manifold.

15.1.2 Mass assignments of the mass spectrometer are checked and adjusted by using perfluorotributylamine (FC43). For detail refer to HP manual number HPG1034-90043.

15.1.3 The BFB spectrum, 15 ng approximately, is examined. The resultant mass spectra must meet all of the criteria given in Appendix 3. These criteria must be demonstrated each 12 hour shift.

15.2 Calculations:

15.2.1 Tabulate the area response of the characteristic ions against concentration for each compound and each internal standard. Calculate response factors (RF) for each compound relative to one of the internal standards. The internal standard selected for the calculation of the RF for a compound is the internal standard that has a retention time closest to the compound being measured. The RF is calculated as follows:

$$RF = (A_x C_{is}) / (A_{is} C_x)$$

Where:

A_x = Area of the characteristic ion for the compound being measured

A_{is} = Area of the characteristic ion for the specific internal standard

C_{is} = Concentration of the specific internal standard

C_x = Concentration of the compound being measured

15.2.2 The average RF must be calculated for each compound.

15.3 The internal standard responses and retention times in the check calibration standard must be evaluated immediately after or during data acquisition. If the retention time for any internal standard changes by more than 30 seconds from the last check calibration (12 hours), the chromatographic system must be inspected for malfunctions and corrections must be made, as required. If the Extracted Ion Current Profile (EICP) area for any of the internal standards changes by a factor of two (-50% to +100%) from the last daily calibration standard check, the mass spectrometer must be inspected for malfunctions and corrections must be made, as appropriate. When corrections are made, reanalysis of samples analyzed while the system was malfunctioning are necessary.

15.4 Using the RFs from the initial calibration, calculate the percent relative standard deviation (%RSD) for all of the compounds listed in Appendix 1.

$$\%RSD = \frac{SD}{\bar{x}} \times 100$$

where:

RSD = relative standard deviation

$\bar{x}$ = mean of 5 initial RFs for a compound

SD = standard deviation of average RFs for a compound

$$SD = \sqrt{\sum_{i=1}^{N} \frac{\left(x_i - \bar{x}\right)^2}{N - 1}}$$

15.5 The %RSD for each individual compound must be less than 30%. A maximum of two analytes are allowed to be outside of this criteria; however, their %RSD's must be less than 40%.

15.6 Continuing calibration

15.6.1 Prior to the analysis of samples, run 15 ng of the 4-bromoflurobenzene standard which is in a mix with the internal standards. The resultant mass spectra for the BFB must meet all of the criteria given in Appendix 3 before sample analysis begins. These criteria must be demonstrated each 12 hour shift. A copy of the tune report is shown in Appendix 4.

15.6.2 The initial calibration curve for each compound of interest must be checked and verified once every 12 hours of analysis time. This is accomplished by analyzing a calibration standard that is at a concentration near the midpoint concentration for the working range of the GC/MS.

15.6.3 All the analytes listed in Appendix 1 are used as continuing calibration check compounds (CCC's). For the CCC's, the percent difference (%D) must be less than 25%. A maximum of four compounds are allowed to be outside this criteria. Calculate the percent difference using:

$$\% \text{ Difference} = \frac{\left|\overline{RF}_1 - RF_c\right|}{\overline{RF}_1} \times 100$$

where:

$\overline{RF}_1$ = average response factor from initial calibration

RF_C = response factor from current verification check standard

15.6.4 If continuing calibration fails, then determine why the check failed (i.e. instrument of standards) and make appropriate corrective action. Samples cannot be run until the validity of the calibration has been verified.

16.0 INSTRUMENT PERFORMANCE REQUIREMENTS

16.1 Prior to sample analysis, the instrument must pass a BFB (4-bromofluorobenzene) tune. Tuning criteria are found in Appendix 3. If the instrument does not pass the tune, then corrective action is taken such as manually tuning the instrument and then shooting another BFB tune. Once the instrument is tuned, a twelve hour run window is opened. The instrument must also successfully pass a continuing calibration standard to verify the validity and linearity of the existing multipoint. If the continuing calibration check fails, (see section 15.6 for passing criteria) then the instrument may need to be re-calibrated or adjusted. Analyte retention times in the check must not vary by more than 30 seconds from the established retention times. Peak shapes should be examined for excessive tailing or other abnormalities and internal standard areas must be checked to ensure that they are not too high or low. A blank must also be run which contains no hits of target analytes at or above the reporting default value.

16.2 Hard copies of the tune, check standard, blank, dup, leak check, and 3550A QA/QC are kept in a folder along with copies of each sample run and a daily sequence. When a peer reviews the raw data, he/she initials the page indicating that it was checked. Raw data is stored in filing cabinets in the lab for approximately one year, or until space runs out. The data is then boxed and moved to storage. All data is also "backed up" on magnetic computer tape for a minimum of one year.

17.0 ANALYST AND METHOD VERIFICATION REQUIREMENTS

17.1 To ensure that the instrument can generate reliable, accurate data, an analyst must run, and successfully pass, a BFB tune, continuing calibration check, and an instrument blank. Hard copies of this data are kept with the sample runs in a folder marked with the instrument #, date, and batch #. Prior to running EPA Compendium Method TO-14, an analyst should run four to five replicates of a QC check standard to establish his or her proficiency at using the method. This data is filed in the same fashion as other data.

17.2 Method Detection Limits (MDL's) are calculated annually. Please refer to the SOP GL-LB-E-001 for the Determination of Method Detection Limits for additional information. The results of the MDL studies are kept on file in the Volatile section of the Organics Department.

18.0 ANALYSIS PROCEDURES AND INSTRUMENTAL OPERATION

18.1 A precisely measured volume, 200 mL, is removed from the canister, passed through a Nafion dryer to remove water vapor, and concentrated on a cryogenic nickel trap filled with nonsilanized glass beads at -150° C. The trap is thermally desorbed at 150° C and analytes are refocused at the head of the capillary column. The gas chromatograph is temperature programmed to separate the analytes which are then detected with a mass spectrometer.

18.2 Daily GC/MS Run Procedure:

18.2.1 At the beginning of each day or 12 hour run window, the GC/MS system is checked to see if acceptable performance criteria are achieved. A 15 ng BFB standard is run and must pass before any blank or samples are analyzed. The passing criteria is listed on the tune report (see Appendix 4). If the tune does not pass, the GC/MS needs to be manually retuned.

18.2.1.1 To do so: Open the CAL gas valve, PFTBA. From FMGR type MTUNE and return. Refer to Hewlett Packard manual HPG 1034-90043 for suggestions concerning tuning.

18.2.2 If the tune passes, then a 10 ppbv continuing calibration check standard must be run. The check is made in 6 L canister with zero grade air. Internal standards are added by the autosampler to each run . For passing criteria see section 15.6.

18.2.2.1 If the CCC's fail the specific criteria, then adjustments need to be made to the instrument and run another check.

18.2.3 All samples and standards solutions are allowed to equilibrate before analysis.

18.2.3.1 The internal standard responses and retention times in check calibration must be checked. If retention times for any ISD changes by more than 30 seconds from the last check calibration, the system must be checked for possible malfunctioning. Area count for any of the ISD must be between -50% to +100% of the last daily check.

18.3 After each batch of samples is run, run logs are produced by computer generated sequence . The run logs document each sample that was run along with all of the quality control. Multipoints, tunes, and check standards are also recorded in the run log. There is a separate run log for each instrument.

18.4 The HP 5972 Mass Selective Detector analyzes minute amounts of material by fragmenting the sample into charged ions, separating them on the basis of molecular weight-to-charge ratio, and then counting the ions as they enter the detector. The counted ions identified by mass can be plotted on a graph with the mass on the x-axis and the counted ions or abundances on the y-axis.

18.5 The instrument is never really "turned on and off." Startup begins when a sequence is initiated.

18.6 Air samples are introduced onto the instrument at 200 mL volume. Internal standards are added automatically at 25 ppbv concentration to each run.

18.6.1 The pressure of each canister is checked. If the pressure is above 30 Psig, the excess pressure is vented. If the pressure is less than 10" Hg, it is pressurized to atmospheric or up to 30 Psig.

18.7 The Graseby NuTech autosampler 3600 features 16 purges positions. Samples can be racked on the autosampler and programmed to run automatically.

18.7.1 Each sample name, volume (aliquot), method, and manifold position are loaded into the NuTech 3550A data system name list.

18.7.2 An automated leak check is run on each position. A hard copy of the leak check results is included with the data package.

18.7.3 A name list identical to NuTech name list is written to the GC/MS sequence list.

18.7.4 The operating conditions for NuTech is outlined in Appendix 5. For more detail see NuTech manual version 2.0 Dec., 1993.

18.8 An example of instrument output (quant report) is provided in Appendix 6.

19.0 CALCULATIONS AND DATA REDUCTION METHODS

19.1 Qualitative Analysis:

19.1.1 A compound is identified by 1) a comparison of the sample mass spectrum with the mass spectrum of a standard reference of the suspected compound. Mass spectrum for standard reference must be obtained on the users GC/MS and 2) elution of sample component at the same GC relative retention time (RRT) as those of the standard component.

19.1.2 The sample component RRT must compare within ± 30 seconds of the RRT of the standard component, run in the same 12 hour period. If coelution of another compound prohibits accurate assignment of the sample component RRT from the total ion chromatogram, the RRT is assigned by using extracted ion current profiles for ions unique to the components of interest. Pay close attention to the following compounds for possible coelution and identification: 1,1,1-trichloroethane, carbon tetrachloride; m,p-xylenes and ethylbenzene; the three dichlorobenzene isomers; chloromethane and dichlorodifluoromethane; o-xylene and styrene; cis-1,3 dichloropropene and trans - 1,3-dichloropropene.

19.1.3 For samples containing components not associated with the calibration standards, a library search may be performed when requested by the client for the purpose of tentative identification. A library search of the blank for that day must be performed for contamination check.

19.2 For example calculations which relate calibration methods, response factors, etc. to calibration curves refer to section 15.

19.3 Quantitative Analysis

The concentration of each identified analyte in the sample is calculated as follows:

$$\text{Amount} = \frac{(Ax)(C_{IS})(DF)}{(A_{IS})(RF)(S)}$$

where:

S =Sample size, liters

Where applicable, an estimate of concentration for non calibrated components in the sample is made. The formulas given above is used with the following modifications: The areas A_x and A_{is} should be from the total ion chromatograms, and the RF for the compound should be assumed to be 1. The concentration obtained is reported indicating (1) that the value is an estimate and (2) which internal standard was used to determine concentrations. Use the nearest internal standard free of interferences.

When duplicates and spiked samples are analyzed, report all data obtained with the sample results.

19.4 Results are reported to the nearest one hundredth.

19.5 Data is reported in unit of ppbv.

19.6 All data is stored by date, instrument, and analyst in filing cabinets in the lab. The data is also "backed up" on magnetic tape.

20.0 DATA RECORDING

Data is recorded as a quantitation report which is generated by the Hewlett-Packard GC/MS and its associated computer system, MS-DOS chemstation. All calculations and comments are recorded directly on the quant reports (see Appendix 6).

21.0 QUALITY CONTROL REQUIREMENTS

21.1 Frequency of Quality Control Activities

21.1.1 Initial and Continuing Calibration

21.1.1.1 Before the analysis of any blanks or samples, the instrument must be calibrated. This multilevel initial calibration is used to establish the linearity of the instrument for the analytes of interest. Once this calibration is in place, the frequency thereafter is determined from the analysis of continuing calibration standards.

21.1.1.2 In Compendium Method TO-14 , the continuing calibration standard is also used to verify the instrument calibration compared to the last multilevel calibration analyzed. However, when performing analysis according to the protocol set down by this method, the continuing calibration check must be done every 12 hours.

21.1.2 Blank Analysis

21.1.2.1 Method Blanks are used to determine background (laboratory) concentrations of target analytes that have the potential of interfering with sample analysis. For method TO-14, the blank is analyzed with each analytical batch which contains a maximum of 20 samples.

21.1.2.2 Compounds methylene chloride and 1,1,1-trichloroethane are normally present in the system blank at concentration less than 2 ppbv.

21.1.3 Duplicate Analysis

21.1.3.1 Accuracy is monitored through the analysis of an internal standard spike in each run.

21.1.3.2 Precision is monitored through the analysis of duplicates. A duplicate is done for every ten samples or one in a batch. Relative percent difference (RPD) for duplicate analysis must be less than 20%.

$$RPD = \frac{|A_1 - A_2|}{\overline{A}} x100$$

where:

A_1 = amount determined in first analysis

A_2 = amount determined in second analysis

$\overline{A}$ = average determination

21.1.4 Surrogate Spike, BFB, is added to all standards, blanks, duplicates, and samples for monitoring purposes only.

21.2 Acceptance Limits for Quality Control Activities

21.2.1 Initial Calibration

21.2.1.1 The %RSD for all analytes listed in Appendix 1 must be less than 30%. A maximum of two analytes are allowed to be outside of this criteria; however, their %RSD must be less than 40%.

21.2.2 Continuing Calibration

21.2.2.1 When doing analyses according to method TO-14, the instrument calibration must be verified every 12 hours through the analysis of a continuing calibration standard. This standard CCC's contains every analyte of interest.

For the CCC's the percent difference must be less than 25%. A maximum of four compounds are allowed to be outside of this criteria.

21.2.3 The criteria for method blanks are that the methylene chloride and 1,1,1,-trichloroethane must be less than 2 ppbv, and all other analytes must be less than the LPQL.

21.2.4 Duplicates

21.2.4.1 The criteria for sample duplication when using method TO-14, are that any target present over five times the detection limit must be within ± 20% of each other.

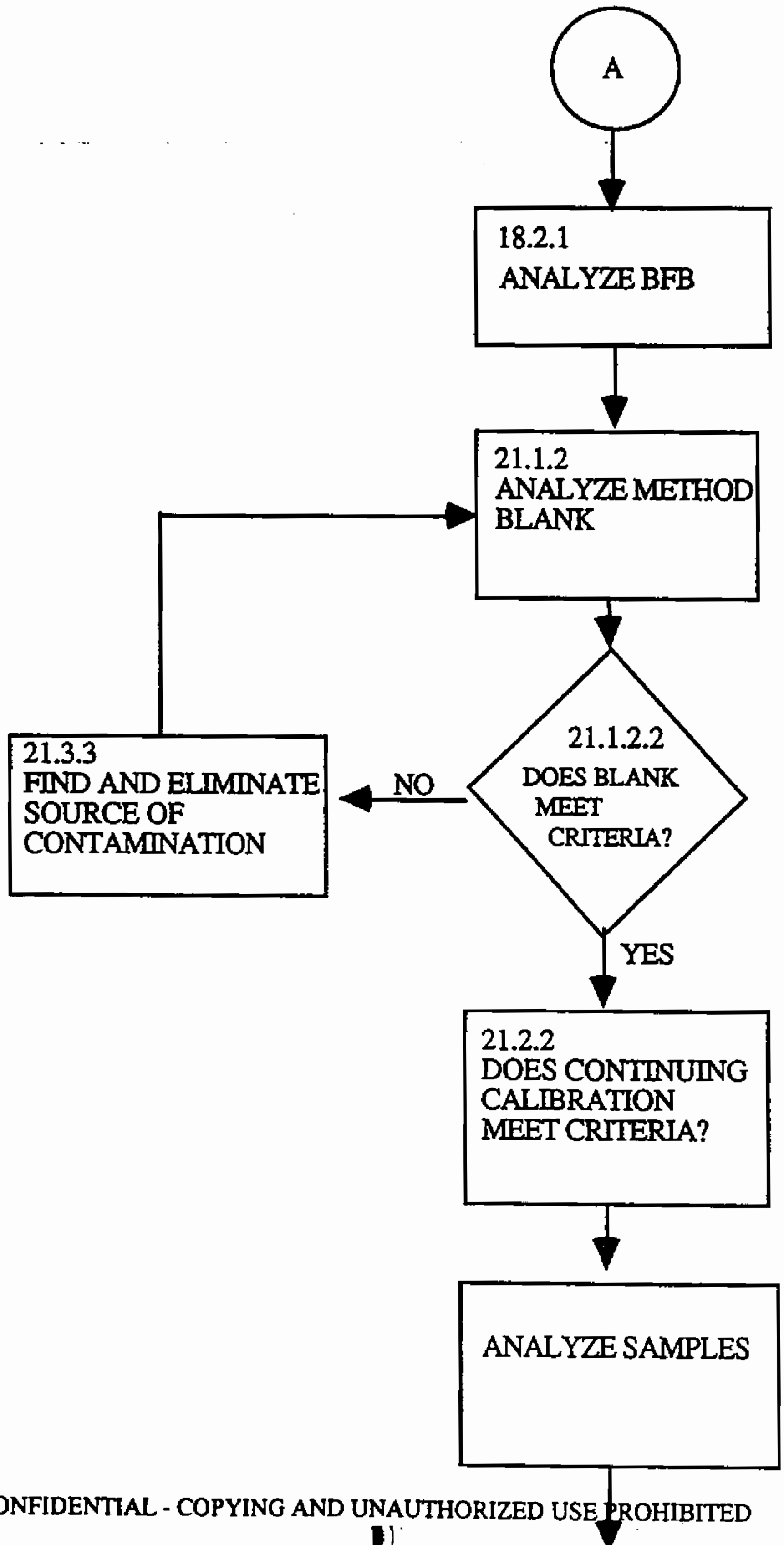
21.3 Nonconformance

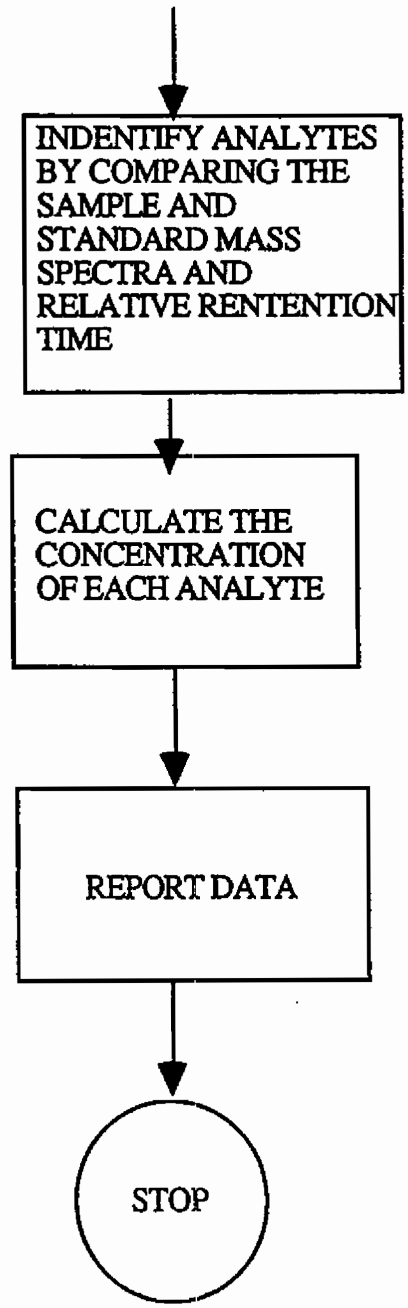
21.3.1 When running a multi-point calibration for many analytes at once, the chances are high that a few may not meet the criteria. Additional standards for just the compounds not meeting may be reanalyzed. If they still do not meet the requirements, the instrument may need maintenance before continuing or new standards may be needed.

21.3.2 If the continuing calibration fails any of the criteria in Section 15, the analyst must take action to correct the situation. This may be retuning, reanalyzing the standard, adjusting the purge flow, or any number of maintenance practices in order to meet the daily calibration. If all attempts fail, a new series of multi-point calibration standards must be analyze.

21.3.3 When the blank fails the criteria defined in section 21.1.2.2, find and eliminate the source of contamination before proceeding with the analyses. Another blank must be run before samples can be analyzed.

21.4 The manner in which data will be accepted or rejected is described in the flowchart in Figure 1.1.


A
18.2.1
ANALYZE BFB
21.1.2
ANALYZE METHOD BLANK
21.1.2.2
DOES BLANK MEET CRITERIA?
NO
21.3.3
FIND AND ELIMINATE SOURCE OF CONTAMINATION
YES
21.2.2
DOES CONTINUING CALIBRATION MEET CRITERIA?
ANALYZE SAMPLES



21.5 If corrective action needs to be taken, a corrective action form is completed and signed by the analyst, group leader, and a QC officer. The appropriate action(s) is then taken.

21.6 In addition to the quality control requirements described above, each GC/MS system must be demonstrated to meet the tune criteria listed below for bromofluorobenzene every 12 hours.

Mass	Ion Abundance Criteria
50	15-40% of mass 95
75	30-60% of mass 95
95	base peak, 100% relative abundance
96	5-9% of mass 95
173	less than 2% of mass 174
174	greater than 50% of mass 95
175	5-9% of mass 174
176	greater than 95% but less than 101% of mass 174
177	5-9% of mass 176

22.0 DATA REVIEW, VALIDATION AND APPROVAL PROCEDURES

22.1 All data must be reviewed by another analyst before it is reported. The reviewer must check the data report against the raw data and verify the validity and accuracy of the data. (See Appendix 7 for an example of a Data Review Checklist.)

22.2 All data is reviewed in a batch before that batch is sent to "done".

22.3 The levels of review responsibility are:

22.3.1 First level review: The analyst must ensure the overall quality of the data. Included in this review are: the tune, check, blank, duplicate, and the sample runs.

22.3.2 Second level review: A peer must review all of the data before it can be released from the lab. The peer should perform all of the checks that the first analyst did and compare the data with the run log. Particular attention should be paid to the 12 hour tune window, the check standard, and internal standard area counts. All hits should also be reviewed very carefully. When the second level review is complete, the peer initials a check sheet as well as the data. The group leader is then informed that the data has been reviewed a second time and is ready to be released from the lab to the quality department.

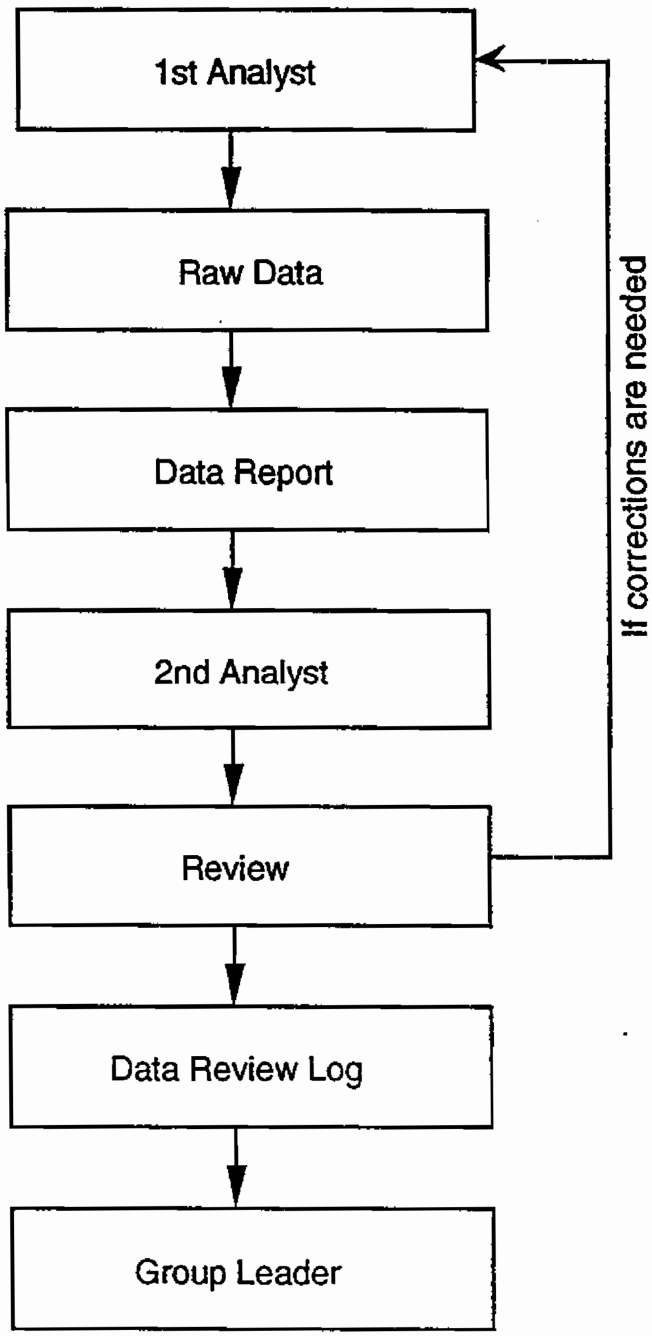
22.4 Items checked in the first level review are the tune, continuing calibration, blanks, duplicates, and each sample. In each sample the dilution is verified, surrogates are checked, and each hit is checked to verify its validity and accuracy.

22.5 A log is maintained to record the batch number and the reviewer's initials. In addition, the reviewer initials the checked data report.

22.6 The data review checklist is filled out and passed on to the group leader.

22.7 All raw data, along with a copy of the data report and the run log, is needed to complete the review process.

22.8 A flow chart showing the process by which papers and documents undergo review follows.



23.0 DATA TRANSMITTAL

After the data has been peer reviewed and is ready for reporting, the group leader is informed and sends the batch to done.

24.0 RECORDS MANAGEMENT AND DOCUMENT CONTROL

24.1 A run log which lists everything that was run on a particular instrument is incorporated into the computer-generated laboratory notebook.

24.2 Maintenance Log - Refer to section 13.

24.3 All raw data is kept on file in the lab for approximately three months. After this time, it is boxed and stored at GEL for seven years. All data is also "backed up" on magnetic computer tape cartridges which are stored in the lab for one year.

25.0 LABORATORY WASTE HANDLING AND DISPOSAL: SAMPLES, EXTRACTS, DIGESTATES AND REAGENTS

25.1 All organic waste solvents, extracts, and reagents are stored in a certified hazardous waste can. When the can is full, the GEL hazardous waste disposal specialist is called.

25.2 All canisters are sent for cleaning outlined in the Compendium Method TO-14 and recertified for further sampling.

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APPENDIX 1

METHOD 8240 VOLATILE ANALYTES

Dichlorodifluormethane
Chloromethane
1, 2 - Dichloro -1, 1, 2, 2 - tetrafluoroethane
Vinyl Chloride
Bromomethane
Chloroethane
Trichlorofluoromethane
1,1-Dichloroethene
Methylene Chloride
3 - Chloropropene
1, 1, 2 - Trichloror 1, 2, 2 - trifluoroethane
1, 1 -Dichloroethane
cis-1,2-Dichloroethene
Chloroform
1, 2 - Dichloropropane
1, 1, 1 - Trichloroethane
Benzene
Carbon Tetrachloride
1,2-Dichloropropane
Trichloroethene
cis-1,3-Dichloropropene
trans-1,3-Dichloropropene
1, 1, 2 - Trichloroethane
Toluene
1,2-Dibromoethane
Tetrachloroethene
Chlorobenzene
Ethylbenzene
m, p - Xylenes
Styrene
1, 1, 2, 2 - Tetrachloroethane
o - Xylene
1 - Ethyl - 4 - methylbenzene
1, 3, 5 - Trimethylbenzene
1, 2, 4 - Trimethylbenzene
Benzyl chloride
1, 3 - dichlorobenzene
1, 4 - dichlorobenzene
1, 2 - dichlorobenzene
1, 2, 4 - Trichlorobenzene
hexachlorobutadiene

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APPENDIX 2

CANISTER RECEIPT LOG BOOK

Date/Init.	Client	Can. No	Lab No	Pi(psig)	Pf(psig)	Dil	Comments

Page ____

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APPENDIX 3

BFB MASS - INTENSITY SPECIFICATIONS (4-BROMOFLURORBENZENE)

MASS	Intensity Required (relative abundance)
50	15 to 40% of mass 95
75	30 to 60% of mass 95
95	base peak, 100% relative abundance
96	5 to 9% of mass 95
173	less than 2% of mas 174
174	greater than 50% of mass 95
175	5 to 9% of mass 174
176	greater than 95% but less than 101% of mass 174
177	5 to 9% of mass 176

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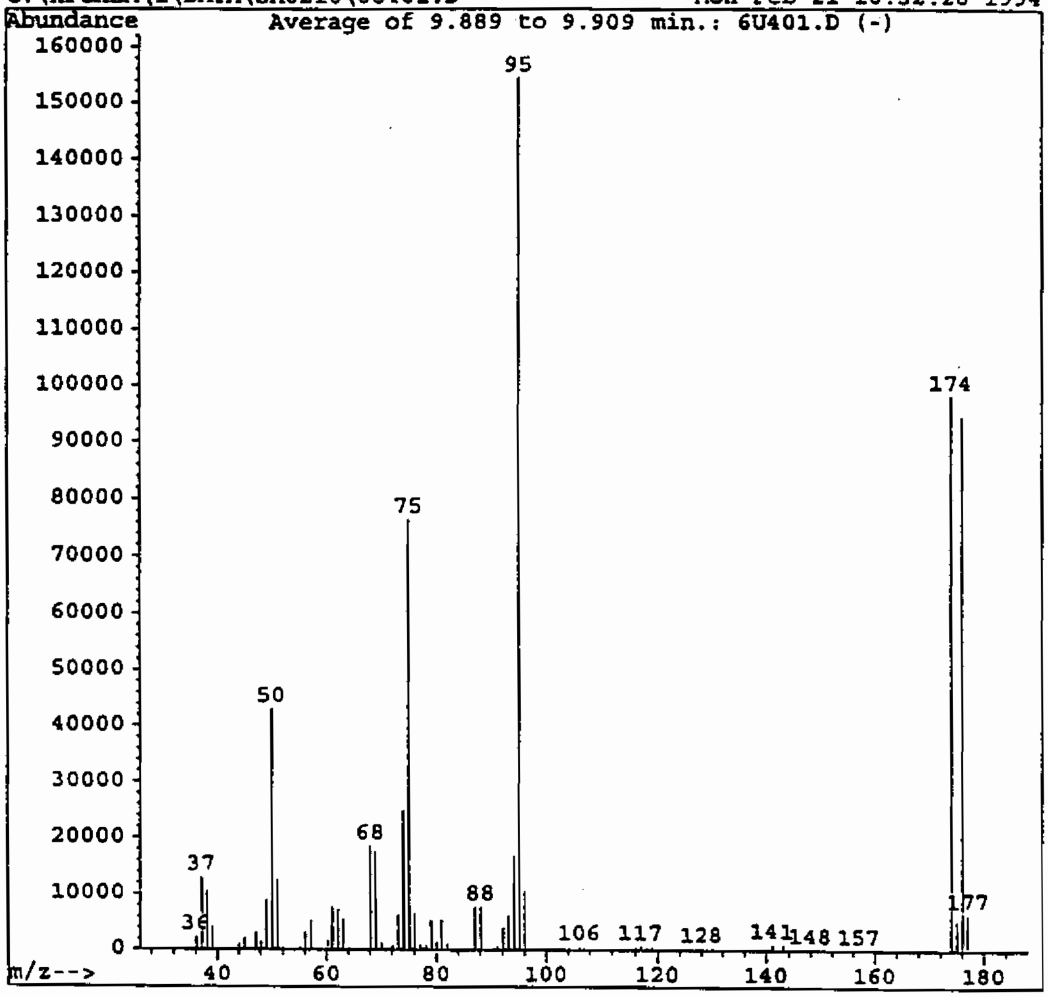
APPENDIX 4

BFB 624 Results

C:\HPCHEM\1\DATA\SA0210\6U401.D Mon Feb 21 10:32:28 1994



Peak Apex is scan: 505
Average of 3 scans: 504,505,506 minus background scan 495

Target Mass	Comparison Mass	Lower Limit,%	Upper Limit,%	Relative Abundance,%	Result Pass/Fail
50	95	15	40	27.9	PASS
75	95	30	60	49.6	PASS
95	95	100	100	100.0	PASS
96	95	5	9	6.8	PASS
173	174	0	2	0.0	PASS
174	95	50	100	63.6	PASS
175	174	5	9	5.5	PASS
176	174	95	101	96.2	PASS
177	176	5	9	7.0	PASS

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APPENDIX 5

OPERATING CONDITION FOR NUTECH

	HEAT	COOL
Cryotrap	150° C	-150° C
Cryofocus	150° C	-150° C
Sample Dryer	60°	125° C
Sample Purge	180 sec	
Internal Standards	60 sec	
GC Run Delay	15 min	
Sample Flow Rate	50 mL/min	
Minimum Flow Rate	10 mL/min	

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APPENDIX 6

Quantitation Report

```
Data File : C:\HPCHEM\1\DATA\SA0214\6V104.D
Acq Time  : 14 Feb 94  11:12 am                    Operator: MKP
Sample    : 10 PPBV STD                            Inst    : 5972- Ins
Misc      :                                        Multiplr: 1.00
Quant Time: Feb 14 11:39 1994

Method       : C:\HPCHEM\1\METHODS\TO14_LCI.M
Title        : TO-14 FIVE POINT CALIBRATION
Last Update  : Mon Feb 14 16:51:38 1994
Response via : Multiple Level Calibration
```

Internal Standards	R.T.	QIon	Response	Conc Units	Dev(Min)
1) Bromochloromethane	11.19	128	333219	25.00 ppbv	0.01
15) 1,4-Difluorobenzene	12.86	114	1543129	25.00 ppbv	0.00
29) Chlorobenzene-d5	17.83	117	1264607	25.00 ppbv	-0.01
System Monitoring Compounds					%Recovery
37) 4-Bromofluorobenzene	19.91	95	453866	15.67 ppbv	104.44%
Target Compounds					Qvalue
2) Dichlorodifluoromethane	3.81	85	341988	10.68 ppbv	99
3) Chloromethane	4.29	50	174022	11.08 ppbv	99
4) 1,2-Dichloro-1,1,2,2-tetra	4.22	85	367821	10.58 ppbv	86
5) Vinyl chloride	4.62	62	154414	11.20 ppbv	99
6) Bromomethane	5.48	94	94672	11.03 ppbv	97
7) Chloroethane	5.76	64	42791	11.88 ppbv	99
8) Trichlorofluoromethane	6.39	101	247688	15.96 ppbv	100
9) 1,1-Dichloroethene	7.52	96	104769	10.40 ppbv #	85
10) Methylene chloride	8.47	84	118029	10.40 ppbv	91
11) 3-Chloropropene	8.25	76	53753	10.36 ppbv	94
12) 1,1,2-Trichloro-1,2,2-trif	7.56	101	227523	10.60 ppbv	93
13) 1,1-Dichloroethane	9.77	63	290151	11.15 ppbv	99
14) cis-1,2-dichloroethene	10.77	96	117424	10.38 ppbv #	85
16) chloroform	11.30	83	276194	10.40 ppbv	100
17) 1,2-Dichloroethane	12.28	62	206253	10.93 ppbv	98
18) 1,1,1-Trichloroethane	11.65	97	211769	10.22 ppbv	94
19) Benzene	12.28	78	400247	11.02 ppbv	97
20) carbon tetrachloride	11.93	117	179498	10.05 ppbv	99
21) 1,2-Dichloropropane	13.69	63	187820	10.90 ppbv	98
22) Trichloroethene	13.32	130	133035	9.63 ppbv	98
23) cis-1,3-Dichloropropene	14.86	75	240302	10.79 ppbv	84
24) trans-1,3-dichloropropene	15.77	75	171695	10.35 ppbv	95
25) 1,1,2-Trichloroethane	16.09	97	139693	10.41 ppbv	89
26) Toluene	15.45	92	239497	10.11 ppbv	88
27) 1,2-Dibromoethane	17.03	107	213775	10.15 ppbv	99
28) Tetrachloroethene	16.40	166	149391	10.01 ppbv	97
30) Chlorobenzene	17.88	112	283504	10.00 ppbv	84
31) Ethylbenzene	18.04	91	626897	10.57 ppbv	95
32) m,p-Xylenes	18.24	106	325996	20.58 ppbv	89
33) Styrene	18.96	104	12596	4.12 ppbv #	83
34) 1,1,2,2-Tetrachloroethane	20.11	83	362788	10.77 ppbv	99
35) o-Xylene	18.96	106	161660	10.12 ppbv	100
36) 1-Ethyl-4-methylbenzene	20.55	105	456495	9.85 ppbv	99
38) 1,3,5-Trimethylbenzene	20.55	105	456495	9.85 ppbv	96
39) 1,2,4-trimethylbenzene	21.36	105	385835	9.65 ppbv	85
40) Benzyl chloride	22.32	91	116521	7.06 ppbv	75

(#) = qualifier out of range (m) = manual integration
6V104.D TO14_LCI.M Thu Feb 24 09:38:26 1994 Page 1

Quantitation Report

Data File : C:\HPCHEM\1\DATA\SA0214\6V104.D
Acq Time : 14 Feb 94 11:12 am
Sample : 10 PPBV STD
Misc :
Quant Time: Feb 14 11:39 1994

Operator: MKP
Inst : 5972- Ins
Multiplr: 1.00

Method : C:\HPCHEM\1\METHODS\TO14_LCI.M
Title : TO-14 FIVE POINT CALIBRATION
Last Update : Mon Feb 14 16:51:38 1994
Response via : Multiple Level Calibration

	Compound	R.T.	QIon	Response	Conc Unit	Qvalue
41)	1,3-dichlorobenzene	21.93	146	259600	9.72 ppbv	92
42)	1,4-dichlorobenzene	22.09	146	260100	9.74 ppbv	92
43)	1,2-Dichlorobenzene	22.80	146	255085	9.72 ppbv	97
44)	1,2,4-Trichlorobenzene	25.88	180	213042	9.87 ppbv	99
45)	hexachlorobutadiene	26.23	225	179255	9.86 ppbv	99

(#) = qualifier out of range (m) = manual integration
6V104.D TO14_LCI.M Thu Feb 24 09:38:27 1994 Page 2

Quantitation Report

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Data File : C:\HPCHEM\1\DATA\SA0214\6V104.D
Acq Time  : 14 Feb 94   11:12 am                    Operator: MKP
Sample    : 10 PPBV STD                             Inst    : 5972- Ins
Misc      :                                         Multiplr: 1.00
Quant Time: Feb 14 11:39 1994

Method        : C:\HPCHEM\1\METHODS\TO14_LCI.M
Title         : TO-14 FIVE POINT CALIBRATION
Last Update   : Mon Feb 14 16:51:38 1994
Response via  : Multiple Level Calibration
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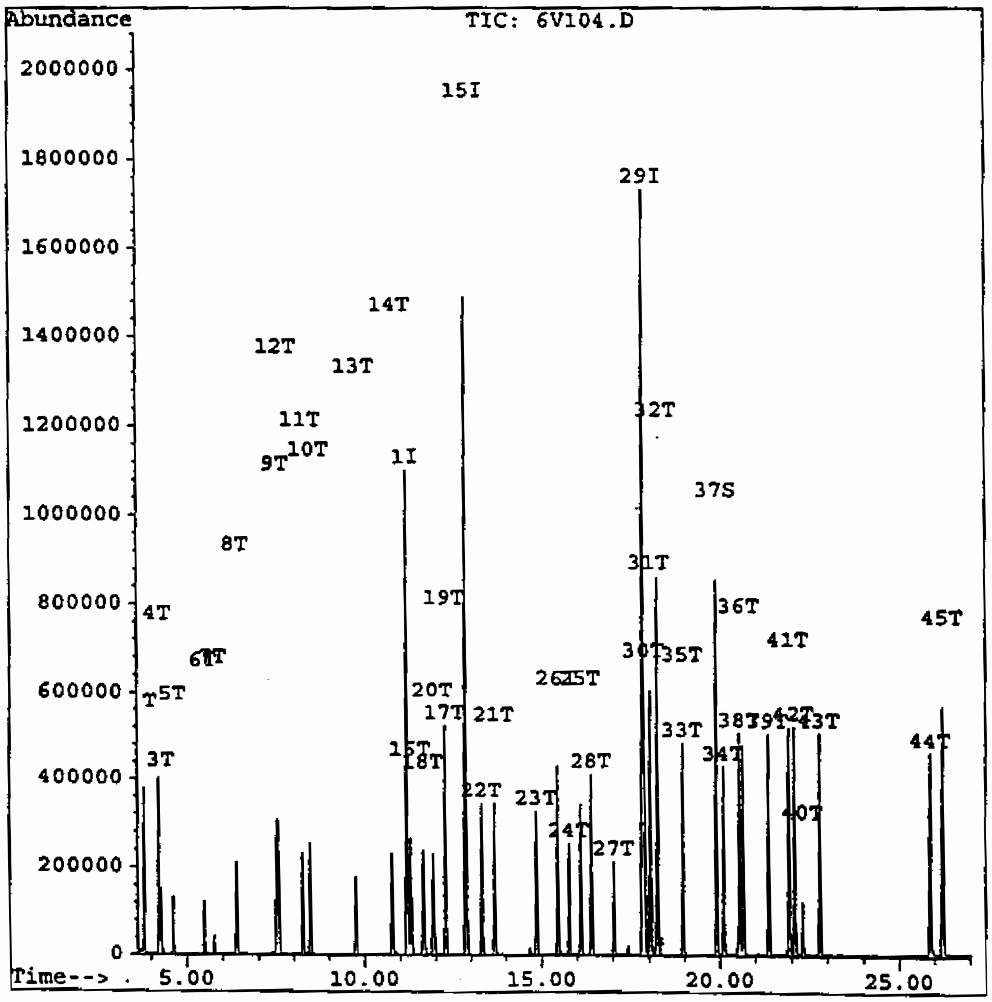

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APPENDIX 7

DATA REVIEW CHECKLIST - GC/MS - VOLATILES

Analyst ______________ Date ______________ Batch # ______________

CRITERIA	YES	NO	COMMENTS
1. Verify holding time on data report.			
2. pH checked and recorded on sequence (624s should not be preserved). (8240s should be approx. 2)			
3. Verify the sample quant reports contain the following information: Sample #, Batch #, dilution, working standard #, method.			
4. A working standard number for check standard must appear on all quant reports and a BFB working standard number must appear on all reports.			
5. Verify tune report - O.K., initialed and dated.			
6. All samples and quality control have injected within twelve hour tune period.			
7. The check standard passes appropriate criteria.			
8. Verify the batch sheet is included to ensure proper method and test for samples being analyzed.			
9. All quant reports contain an extended report except for check standard, MS, and MSD.			
10. Internal standard area counts for QC and samples agree within + or - 50% of check st'd.			
11. Blank passes acceptable criteria, as outlined in the method's SOP.			
12. Matrix spike, spike duplicates, and sample duplicates pass appropriate criteria as outlined by the method's SOP.			
13. All manual integrations are documented by a graphics copy.			
14. All surrogate recoveries in samples & QC are checked for acceptance based on those outlined in the SOP.			
15. Check chromatogram for unidentified peaks.			
16. LIMS data report checked for verification of dilutions, surrogate recoveries, reported target compounds, time, date of analysis, and false hits.			
17. First page of each hard copy of a run is intialed and dated.			

Reviewer ______________________ Date ______________

Final Reviewer ______________________ Date ______________